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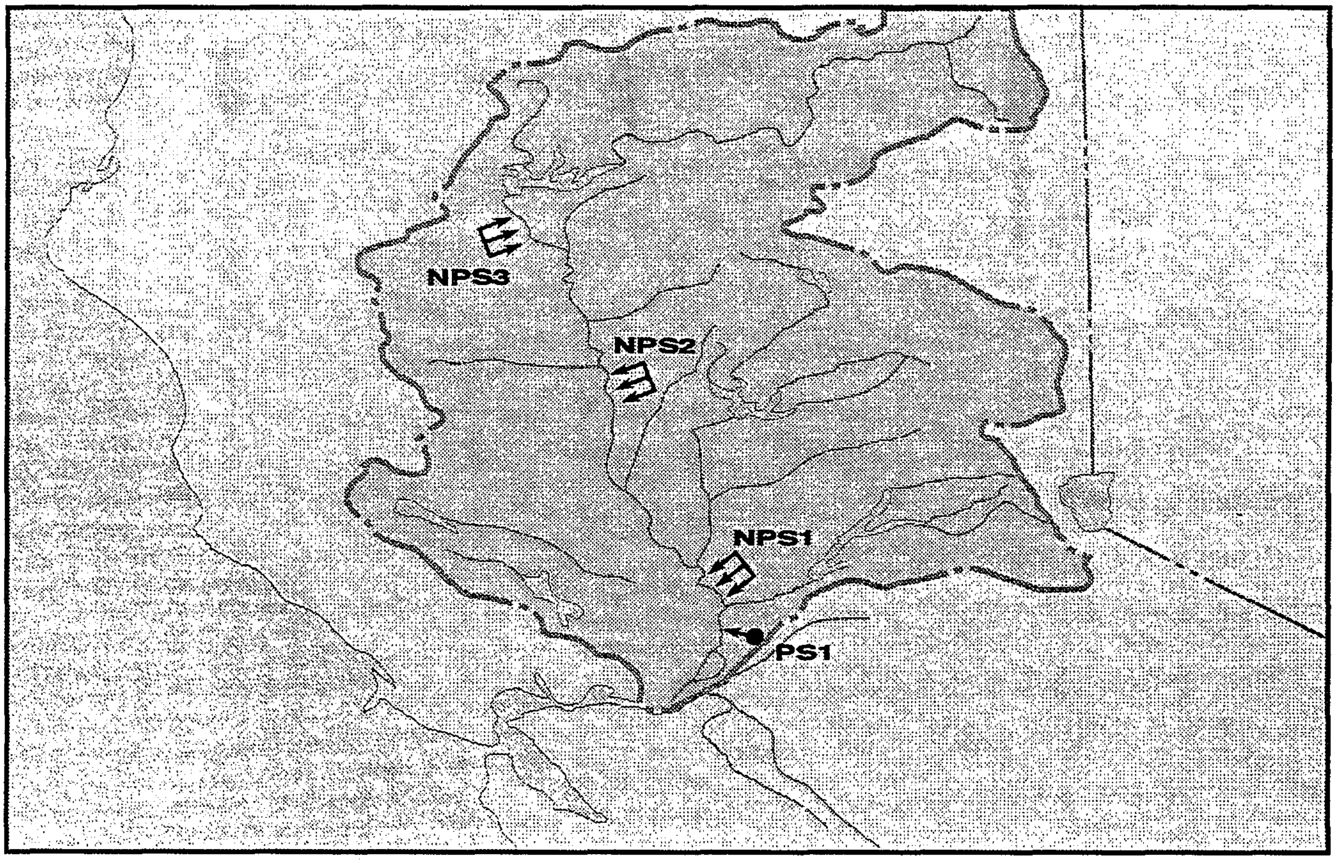
Tri-TAC Water Committee

Technical Issue Paper



Watershed Management Approach To Toxicity Control

August 1992

Technical Issue Paper

WATERSHED MANAGEMENT APPROACH TO TOXICITY CONTROL

Tri-TAC Water Committee

August 1992

WATERSHED MANAGEMENT APPROACH TO TOXICITY CONTROL

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Watershed Management Approach To Toxicity Control

Tri-TAC Water Committee

Executive Summary

August 1992

EXECUTIVE SUMMARY

The League of California Cities, California Association of Sanitation Agencies, and the California Water Pollution Control Association jointly sponsor a technical advisory committee on water, air, and solids issues in California, namely Tri-TAC. In this paper, the Tri-TAC Water Committee analyzes current trends in water quality regulations and suggests revisions to EPA's water quality-based approach to toxics control to maximize the use and impact of public funds.

The Clean Water Act (CWA) and corresponding regulations continue to focus water quality improvement efforts of the nation on increasingly more stringent pollution controls on point sources. With this direction, however, we are rapidly reaching a point of diminishing returns. Review of surface water degradation on a nationwide basis indicates that generally speaking, point sources seem to be responsible for a relatively small proportion of impairment. And yet we are relying primarily on reducing the pollutant contribution from these very same point sources to attain water quality standards. There are many documented cases where a complete achievement of the zero discharge goal from a point source would result in no measurable progress towards meeting the fundamental goal of the Act--the attainment of water quality standards. This emphasis cannot continue if we are to make meaningful progress towards improving the quality of our nation's water. Granted, nonpoint pollution is complex--sources are often diffuse and seldom have specific responsible parties. The requisite tools do not exist to reduce contaminant loadings--we have neither the technology, the resources, nor the regulatory programs in place to effectively control nonpoint sources. However, we need to rethink our current methodology, and incorporate the necessary additional components to ensure that public funds are spent most effectively. Establishing a criterion, i.e. determining background water quality conditions and sources of pollution, maximizing water quality improvements per unit cost, prioritizing specific control measures for all sources of pollutants, both point and nonpoint, and setting an implementation schedule are critical components that have been left out of the decision tree, and may prove invaluable in helping us make informed decisions about allocating our public resources.

REGULATORY BACKGROUND

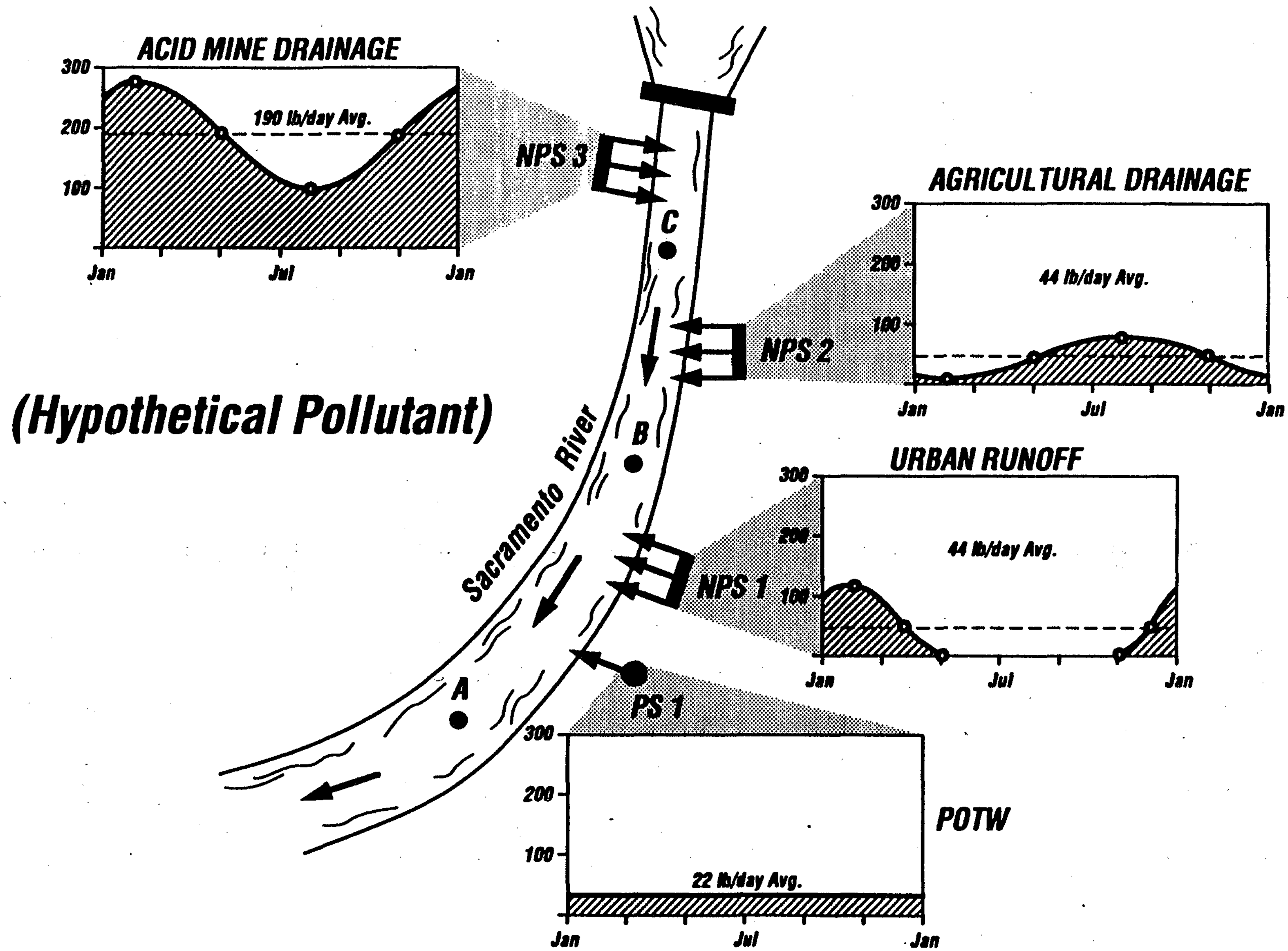
The Clean Water Act was first passed in 1972 in response to growing concerns about the quality of our nation's waters. This landmark legislation provided the regulatory authority and framework for federal and State programs to control sources of pollution. Although revised by amendments in 1977, 1981, and 1987, the original Act continues to guide the nation's water pollution control programs. The effect of the 1987 Act was to refocus the national program (1) from conventional pollutants to toxic pollutants and (2) from a technology-based approach for control of point sources to a water quality-based approach. These shifts resulted from Congress' stipulation that the States adopt numeric water quality standards for all pollutants potentially toxic to humans or aquatic biota. While these concepts were in place even in the 1972 Act, the lack of specific numeric water quality objectives meant that, in general, effluent limitations were dictated by feasible technology rather than water quality standards. The 1987 Act has focused significant emphasis on watershed management; emphasis which, from a cursory analysis, should have been sufficient to ensure the use of this approach. What has happened, however, is that the various watershed planning efforts required under the Act (continuous and area wide planning) have been derailed and have failed to accomplish what Congress intended -- i.e., compliance with water quality standards.

THE SACRAMENTO RIVER EXAMPLE

The Sacramento Regional Wastewater Treatment Plant undertook an attainability analysis to determine the nature and costs of additional controls necessary to comply with the numerical water quality standards for metals adopted in April 1991 by the State of California. The results concluded that the plant effluent would be in violation of water quality standards for cadmium, copper, mercury and zinc. Even by retrofitting the Regional Plant with a $1 billion treatment system consisting of lime precipitation and reverse osmosis, the plant would not meet water quality objectives for copper and mercury. Water quality conditions in the Sacramento River are dominated by nonpoint sources upstream of Sacramento (e.g., mine drainage and agricultural runoff). These discharges are responsible for the river consistently exceeding water quality standards for cadmium, copper, mercury, and zinc. In fact, terminating the existing discharge would have no appreciable effect on metals concentrations in the Sacramento River. As a result, no amount of additional treatment at the Regional Plant will measurably improve water quality in the Sacramento River.

Based upon existing information about the Sacramento River water quality an example has been developed for this watershed to demonstrate Tri-TAC's recommended approach. Figure ES-1 presents pollutant loading data assumed for this example. The results of the analysis conducted for a hypothetical pollutant clearly demonstrate the need to control nonpoint, and not point, sources in the Sacramento River watershed.

Surely, an investigation should be undertaken to determine how public funds could be spent most effectively, in this case by reducing upstream nonpoint pollution contributions. Tri-TAC calls for a



APPROACH EXAMPLE: SACRAMENTO RIVER WATERSHED

FIGURE ES-1

D—038001

watershed management authority to prioritize implementation of specific control measures on a watershed-wide basis, and to disburse public funds to carry out these projects, thereby maximizing water quality improvements per unit cost. This authority should be existing State agencies responsible for permitting (i.e., the State Water Resources Control Board and Regional Water Quality Control Boards in California) to minimize conflicts between the assessment of problems and implementation of solutions for water quality improvement.

WATERSHED MANAGEMENT APPROACH

Tri-TAC's Watershed Management Approach emphasizes consideration of all significant sources of toxic pollutants entering a water body from the entire watershed area and focuses on the source or sources that can most effectively be reduced to achieve compliance with water quality standards in that water body. In some cases this may mean that effluent limitations and related control strategies should be placed on point sources, but many times it will mean that the focus of toxics control efforts should be directed towards nonpoint rather than point sources. Tri-TAC suggests the following modifications to EPA's water quality-based approach:

- **Delay of Numeric Limits in NPDES Permits.** Numeric water quality objectives should be adopted for all navigable waters, but these objectives should not be converted to effluent limits in NPDES permits until watershed management authorities have determined the control of the permitted sources to be a high priority strategy for toxics control.

- **Establishment of Site Specific Water Quality Standards.** It may be appropriate in some water bodies to develop site specific WQSs to scientifically adjust laboratory-derived national criteria for the protection of local aquatic ecosystems.

- **Implementation of Water Quality Monitoring.** Programs should be implemented as soon as possible to assess current water quality conditions and impacts of seasonal variations and improvements in the control of toxic discharges.

- **Development and Implementation of Minimum Standards of Operation.** All significant point sources and nonpoint sources must begin implementing minimum standards of operation to minimize the discharge of toxics to our nation's waterways.

- **Use of Total Maximum Daily Loads (TMDLs).** To determine effective wasteload allocation of point and nonpoint sources the TMDL process should be modified and utilized for all waterways. If this process shows effective control of toxics to be the reduction of nonpoint sources, then the nonpoint sources should be required by NPDES permits to implement the appropriate control measures.

RECOMMENDED ACTIONS

To implement this watershed management approach will require the following actions:

- Amendment of the Clean Water Act to establish the Tri-TAC approach and a corresponding schedule for implementation.

- Amendment of the Clean Water Act to require all nonpoint sources to be subject to NPDES requirements (urban runoff is the only nonpoint source presently subject to NPDES requirements).

- Amendment of the Clean Water Act to require nonpoint sources to comply with pollutant loading reductions determined by the TMDL process.

- In California, utilization of existing State authority to require nonpoint sources to comply with pollutant loading reductions determined by the TMDL process.

- Establishment of existing State or local agencies as watershed management authorities to assess fees and implement watershed management programs.

- Campaign to inform affected agencies and the public of local watershed management programs.

To gain acceptance of the watershed management approach the Tri-TAC Water Committee now plans to meet with appropriate State and federal agencies and legislators. Member agencies can assist by passing on the merits of the watershed management approach to your respective Boards and the public.

Tri-TAC Water Committee

Section 1

Introduction

August 1992

SECTION 1

INTRODUCTION

As we approach the turn of the century, there continues to be a focus in the United States on improving the quality of our nation's waters by controlling discharges from point sources. With this approach, however, we are rapidly reaching a situation where further investments in point source controls will produce diminishing returns. There are many documented cases where achievement of the goal of zero discharges from point sources has resulted in no measurable progress towards meeting the fundamental goal of the Clean Water Act (CWA) - the attainment of water quality standards. This emphasis cannot continue if we are to make meaningful progress towards improving the water quality of our nation's water bodies.

The League of California Cities, California Association of Sanitation Agencies, and the California Water Pollution Control Association jointly sponsor a technical advisory committee on water, air and solids issues in California, namely Tri-TAC. In this paper, the Tri-TAC Water Committee analyzes current trends in water quality regulations and suggests supplements to EPA's water quality-based approach to toxics control that are intended to maximize the use and impact of public funds.

FOCUS ON TOXICITY CONTROL

By enacting the 1987 CWA Amendments, Congress sent the Environmental Protection Agency (EPA) clear directives. The 1987 Act requires States to adopt numeric water quality criteria for priority toxic pollutants [303(c)(2)(B)]. This simple provision is the driving force behind two major changes in policy:

- A shift in focus to toxic compounds from the concern over conventional pollutants, and

- Establishing numerical effluent limits based on protection of ultimate receiving water quality rather than on the basis of feasible treatment technology .

If the current trends in interpretation of the regulations are taken to their logical conclusion, in many cases point sources will need to improve their effluent quality in order to comply with effluent limits derived from the new water quality standards. To achieve the very low levels of toxics in the effluent limits (particularly metals) will likely require advanced treatment (beyond secondary and tertiary). The addition of advanced treatment units will inherently result in cross-media transfer of pollutants through sludge and brine, and will be accompanied by tremendous increases in energy consumption. Adequate consideration has not been given to the wider environmental impacts that accompany advanced treatment. Major questions arise regarding the current direction:

- Will the water quality improvements be worth the incremental air contamination and solid waste disposal problems?

- What will be the economic costs of constructing and operating these advanced treatment plants?

- Will construction of advanced treatment plants results in significant improvements to water quality or attainment of EPA water quality objectives?

SOURCES OF TOXIC POLLUTANTS

The fact that significant further investment in point source controls will produce diminishing returns in water quality enhancement is clearly evident when sources of toxics are evaluated. If we examine data across the country, and certainly in California, nonpoint sources contribute by far the majority of toxic pollutants to our nation's waters. The recently released "National Water Quality Inventory: 1990 Report to Congress"[1] reported that only about 23 percent of the total river miles, 21 percent of the lake acres and 42 percent of estuarine square miles within the United States are known to be fully supporting their beneficial uses. Figure 1-1 presents estimates of the causes of use impairment and sources of pollution for these surface water bodies. As indicated, municipal discharges have only been identified as the source of pollution affecting 16 percent of impaired river miles and 35 percent of impaired estuarine square miles. Thus, even if municipal sources go to zero discharge, the potential for significant improvements in water quality will be questionable.

This point is even further exaggerated with an example closer to home. The San Francisco Bay-Delta Estuary channels two rivers through San Francisco Bay and into the Pacific Ocean. The

1 Information submitted by the States to EPA in 1990 under Section 305(b) of the CWA, Released March 19, 1992, as reported in The Bureau of National Affairs, March 18, 1992, No. 53.

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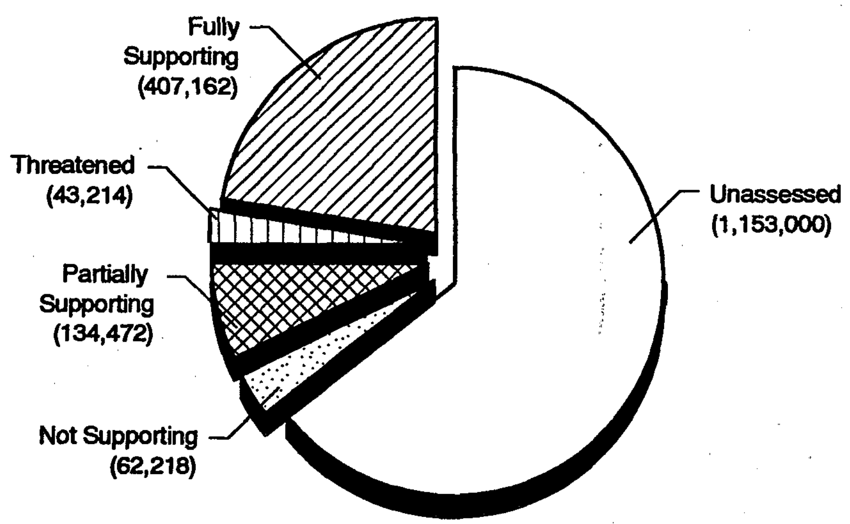
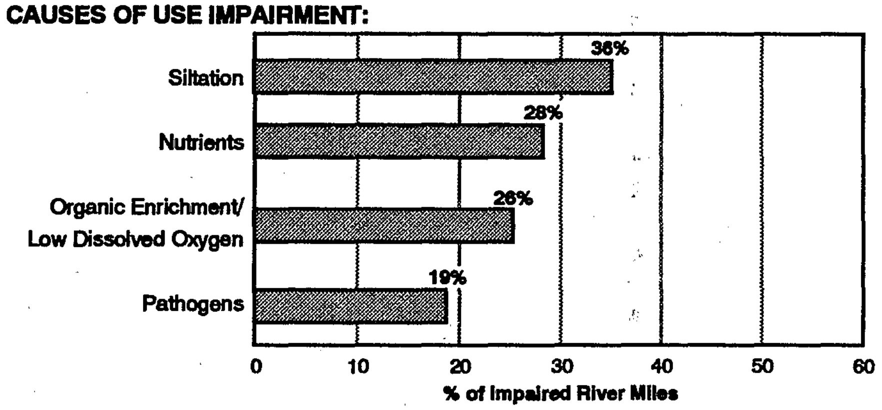
RIVERS

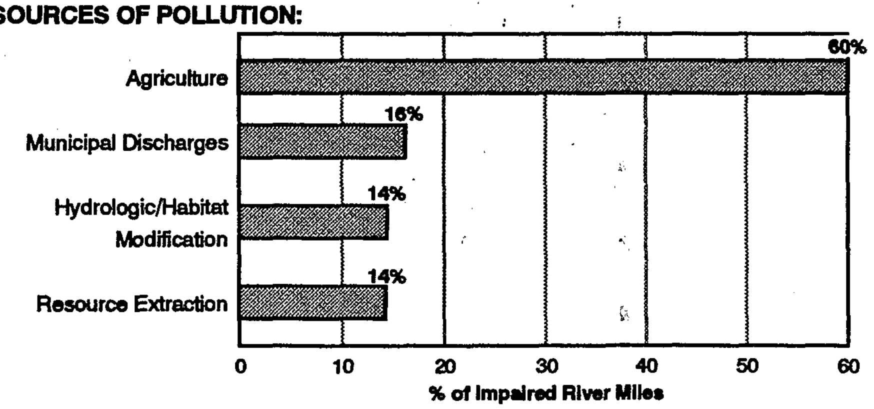
SUPPORT OF DESIGNATED USES (RIVER MILES):



CAUSES OF USE IMPAIRMENT:

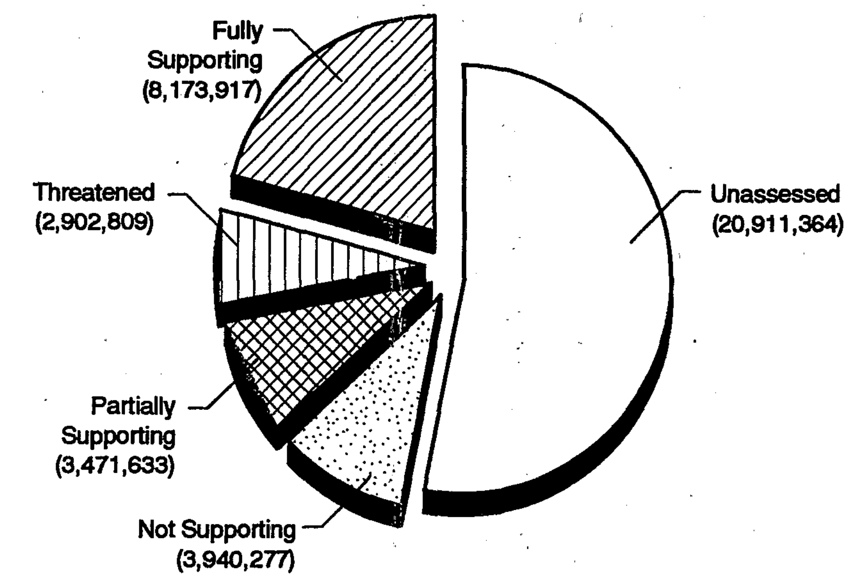


SOURCES OF POLLUTION:



LAKES

SUPPORT OF DESIGNATED USES (LAKE ACRES):



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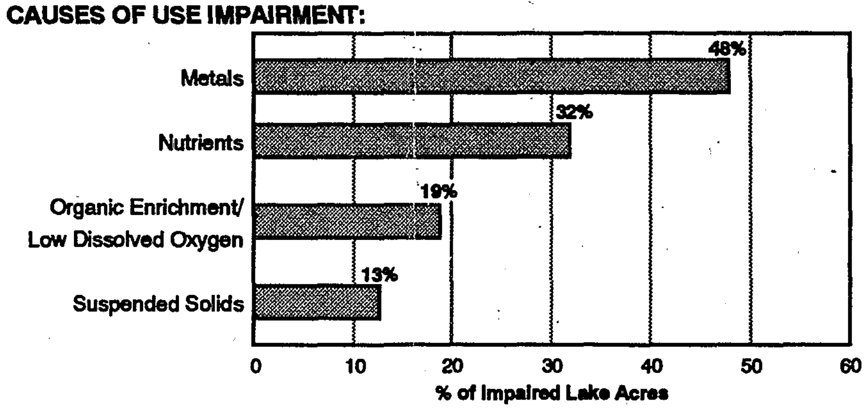
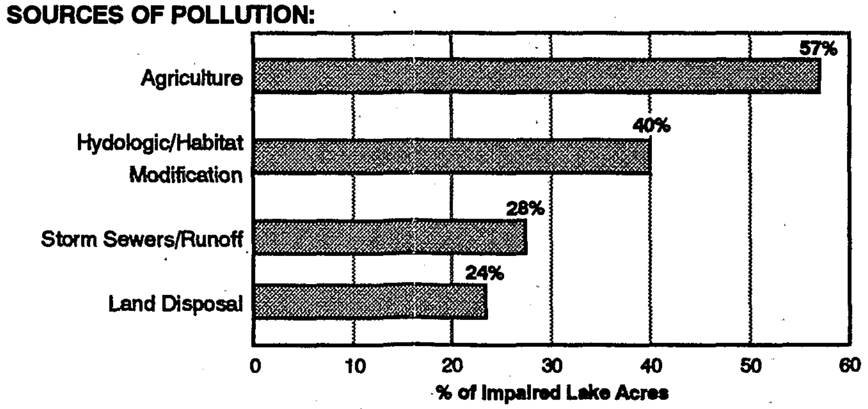
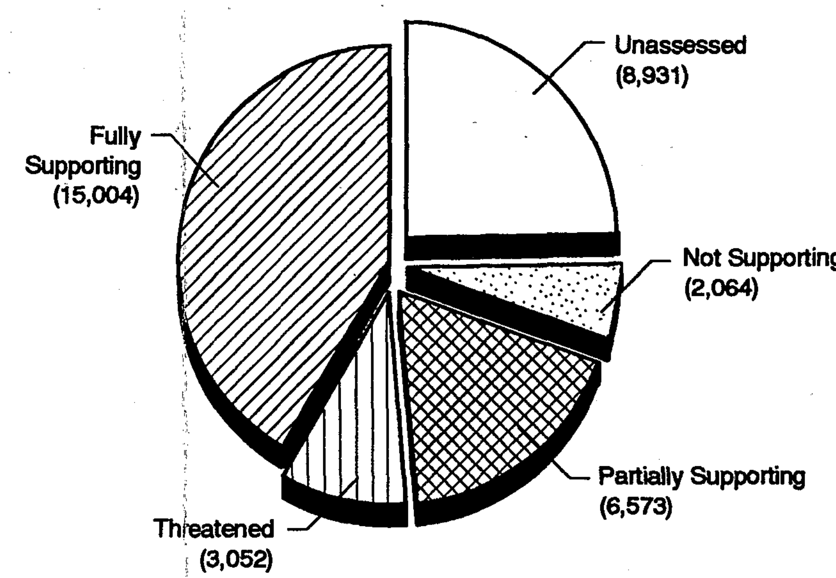


SOURCES OF POLLUTION:



ESTUARIES

SUPPORT OF USES (ESTUARINE SQUARE MILES):



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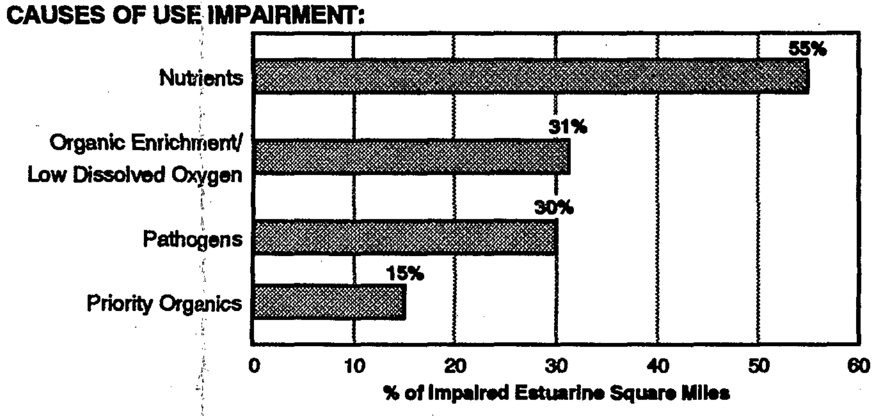
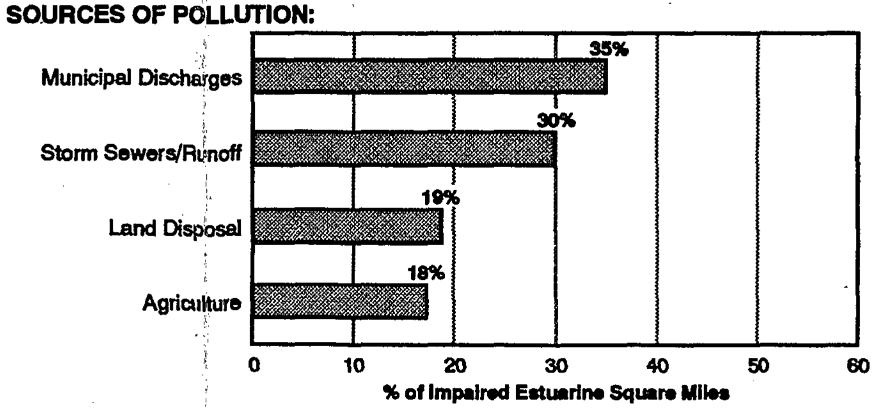


SOURCES OF POLLUTION:



* Taken from The Bureau of National Affairs, Inc., March 18, 1992, No. 53.

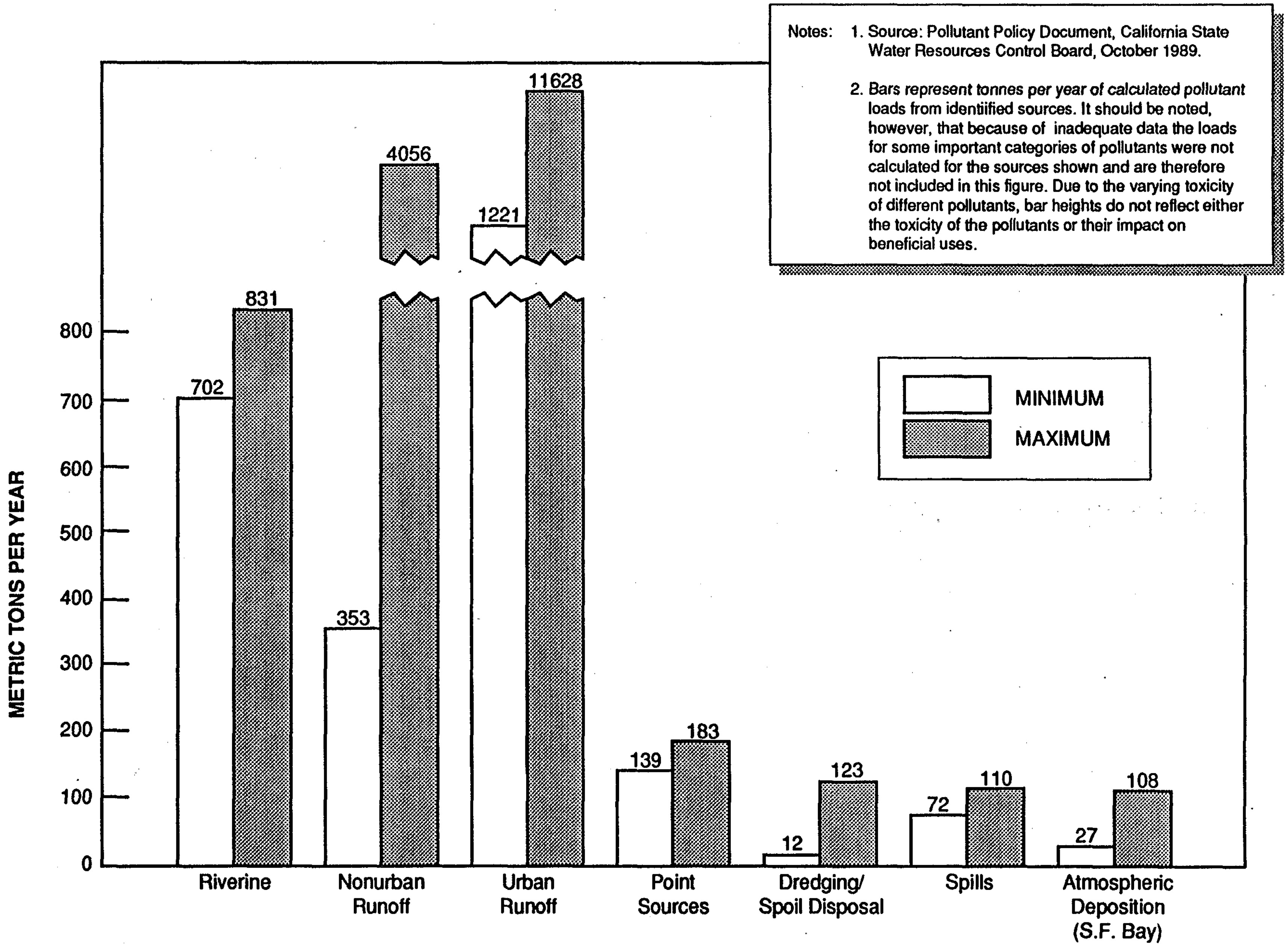
SUMMARY OF NATIONAL WATER QUALITY INVENTORY: 1990 REPORT TO CONGRESS*
(RELEASED MARCH 17, 1992)

Sacramento and San Joaquin Rivers drain over 40 percent of California's landscape. In 1987, the Aquatic Habitat Institute conducted an assessment of the suspected contribution of metals into the Bay-Delta system from various sources (Figure 1-2). Point source contributions ranged between 1.1 and 5.5 percent of the total metric tons discharged into the estuary. If all nonpoint sources are considered in common, they account for between 94.5 and 98.9 percent of the estimated mass loading. When the data are summarized in this way, the numbers do not account for either the varying toxicity of the different pollutants, nor their impacts on beneficial uses. However these numbers provide a convenient rule-of-thumb comparison and emphasize the possibility that even if point source discharges are completely removed, the ambient surface waters are unlikely to meet water quality standards.

This situation points out a critical shortcoming of the federal directives embodied in the 1987 Act. The legislation falls short of establishing any clear criteria for prioritizing control measures to improve water quality. Now is the time to begin the next and far more difficult step of formulating an implementation plan for pollutants on a watershed basis which encompasses nonpoint as well as point sources. As a society we are rapidly coming to realize that we do not have infinite resources to apply to our problems. In these days of economic crisis and drastic shortfalls of public funds, we must judiciously apply our available economic resources to the most critical problems and attempt to maximize the improvements in water quality per unit cost.

WATERSHED MANAGEMENT APPROACH

Despite the difficulties encountered in addressing our water quality problems, aquatic ecosystems are conveniently divided by physical geography into watersheds. The watershed concept is a logical envelope for implementing water quality improvements, already embraced by the nation's regulatory community. Such an approach is not a new concept; it is embodied in various sections of the CWA. However, the Act does not currently include an integrated implementation program other than identifying the first and easiest step of reducing pollutants, from point sources. The watershed management approach for the control of toxic pollutants is the subject of this document. This approach has been formulated by modifying EPA's existing water quality-based approach. By inserting our suggested revisions at critical junctures in EPA's procedures, we hope to incorporate a prioritization process which will maximize the water quality benefit realized from the expenditure of public funds. These will round out EPA's existing approach by stipulating criteria for prioritizing and implementing control measures.



POLLUTANT LOADINGS TO THE SAN FRANCISCO BAY-DELTA ESTUARY

FIGURE 1-2

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D-038009

Introduction

In this paper, Tri-TAC analyzes the current approach to water quality regulations promulgated by EPA through guidance documents. Section 2 presents a brief history of water quality regulations in the United States and summarizes the shifts in emphasis reflected in the 1987 CWA. The Sacramento River is a case example for demonstrating the misplaced emphasis of current regulations on point sources. Section 3 looks at the Sacramento River system and sources of toxics, providing further evidence that the water quality of our surface waters can only be achieved through a reprioritization of control measures to reflect the role of nonpoint sources in degrading water quality. In Section 4, we review EPA's water quality-based approach, and suggest specific changes to provide procedures that assess the effectiveness of reducing various sources in improving water quality as the basis for pollution reduction and allocation decisions. Finally, Section 5 concludes with a summary of recommendations and action steps.

Tri-TAC Water Committee

Section 2

Regulatory Background

August 1992

SECTION 2

REGULATORY BACKGROUND

The purpose of this section is to discuss how existing and proposed federal water quality laws, regulations and initiatives deal with the issue of managing toxic pollutants on a watershed basis. Particular emphasis is placed on the distinction between how point source dischargers are controlled versus how nonpoint sources are controlled.

1972 CLEAN WATER ACT

This landmark legislation was first passed in 1972 in response to growing concerns about the quality of our nation's waters. The Clean Water Act of 1972 provided the regulatory authority and framework for federal and State programs to control sources of pollution. Although revised by amendments in 1977, 1981, and 1987, the original CWA continues to guide the nation's water pollution control programs. Key provisions are discussed below.

Emphasis on Control of Conventional Pollutants

The Act established goals to initially attain fishable/swimmable waters and, ultimately, to eliminate the discharge of pollutants altogether. The 1972 legislation focused primarily on limiting the discharge of conventional pollutants, such as biochemical oxygen demand (BOD) and total suspended solids (TSS). The Act also addressed water quality standards and toxic pollutants, but did so in general terms. It established a national policy to prohibit the discharge of toxic pollutants in toxic amounts [101(a)]. However, no specific programs were enacted to accomplish these general goals and policies. States were required to adopt and periodically update water quality standards to protect the public health and welfare, enhance the quality of water and serve the purposes of the Act [303(c)]. But, again, the Act contained no specific requirements as to what standards were to be adopted or how they were to be implemented.

Emphasis on Control of Point Sources

The 1972 Act focused upon limiting the discharge of pollutants from point sources, namely industries and publicly-owned treatment works (POTWs). Toward this end, the Act established the National Pollutant Discharge Elimination System (NPDES) permit program and provided methods whereby EPA could take enforcement action against NPDES permittees if permit limits were not met. Further, the Act required that NPDES permits contain minimum effluent limitations based on technology (for POTWs based on secondary treatment), but in situations where such treatment is inadequate to achieve water quality standards, more stringent effluent limitations, sufficient to meet the standards, were to be applied [301(b)(1)].

The 1972 Act did not provide for similar regulation of nonpoint sources. Rather it required EPA to issue information on (1) guidelines for identifying and evaluating the nature and extent of nonpoint sources and pollutants, and (2) processes, procedures and methods to control pollution resulting from such sources [304(e)].

Watershed Management

The 1972 Act contained several provisions which required States to implement planning programs to address water quality problems on a regional or watershed basis, rather than on just an individual discharger basis. Specifically, States were required to implement a continuous planning process and a continuing areawide planning program.

Continuous Planning Process. Each State was required to have a continuing planning process which was consistent with the Act [303(e)(1)]. The process was to result in plans for all navigable waters which would include: identification of point source effluent limitations and schedules of compliance; incorporation of all elements of applicable areawide plans prepared under Section 209; development of total maximum daily loads (TMDLs) in accordance with Section 303 (d); and identification of adequate implementation guidelines, including schedules of compliance for new or revised water quality standards, adopted under Section 303(c).

The Act required States to identify those waters for which NPDES effluent limitations were not sufficient to implement water quality standards and to prioritize those waters [303(d)(1)(A)], and to establish TMDLs at levels necessary to achieve the applicable water quality standards [303(d)(1)(C)].

Basin Planning. The 1972 Act required the Water Resources Council to prepare a Level B plan under the Water Resources Planning Act for all basins in the United States, giving priority to those basins which were within areas designated under Section 208 of the Act [209].

D-038013

Areawide Waste Treatment Management. The 1972 Act required that: "To the extent practicable, waste treatment management shall be on an ***areawide basis*** and provide control or treatment of ***all point and nonpoint sources*** of pollution..." [201(c)].

To fulfill this requirement, States were required to implement a continuing areawide waste treatment management process for those areas with substantial water quality control problems [208(a)]. The areawide plans were applicable to all wastes generated within the area and included the establishment of a regulatory program to implement the requirements of Section 201 (c). The plans were to identify a process and set forth procedures and methods of control, to the extent feasible, various nonpoint sources of pollution, including agriculture, silviculture, mine-related sources, and construction activities [208(b)].

1987 CLEAN WATER ACT - A SHIFT IN FOCUS

By the mid-1980's it had become clear that there was a need to focus increased attention on nonpoint sources of pollution and on the control of toxic pollutants. Consequently, the 1987 Clean Water Act Amendments included new provisions requiring States to develop plans for controlling nonpoint sources and to adopt water quality standards for toxic pollutants.

Control of Nonpoint Sources

For nonpoint sources, the 1987 Amendments require the development and implementation of State nonpoint source management programs for navigable waters where nonpoint source inputs contribute to water quality standards not being achieved. Although such programs do not necessarily exclude the implementation of the types of controls required for point sources, the Act requires only that best management practices (BMPs) be implemented "to the maximum extent practicable" [319 (a) and (b)]. Section 405 of the 1987 CWA added Section 402 (p) which specifies NPDES permit requirements for urban stormwater discharges. Thus, the 1987 Amendments essentially classified urban runoff as a point source subject to the same controls as industries and POTWs.

Control of Toxic Pollutants

For toxic pollutants, the 1987 Amendments require that States adopt specific numeric water quality objectives for the EPA priority pollutants for which EPA has developed criteria under section 304 (a) of the Act [303(c)(2)(B)]. The effect of the 1987 Amendments was to shift the focus of the national program (1) from conventional pollutants to toxic pollutants and (2) from a technology-based approach for control of point sources to a water quality-based approach. The shift to a water quality-based approach was the result of the imposition of dozens of additional water quality objectives which will require point source dischargers to employ whatever controls are necessary to achieve effluent limitations based on the standards. While this concept was in place even in the 1972 Act, the general lack of specific numeric water quality objectives meant that, in general, effluent limitations were dictated by minimum technology requirements rather than water quality standards.

EXISTING FEDERAL REGULATIONS

Regulations dealing with basin-wide water quality planning and management are found in 40 CFR Part 130. These regulations require that each State develop water quality standards, undertake a water quality monitoring program, maintain a "continuous planning process" for implementing water quality planning and management requirements, develop a management plan for dealing with existing and potential water quality problems, develop and implement TMDLs and TMDL-based controls (including effluent limits and BMPs) for priority waters, and submit a biennial report to EPA detailing all of the above.

The regulations define a TMDL as the sum of the waste load allocations (WLAs) and the load allocations (LAs). These latter two terms are defined as follows:

WLA: The portion of a receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution.

LA: The portion of a receiving water's total maximum daily load that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources.

These definitions, although somewhat circular, explicitly consider nonpoint sources as warranting attention from the standpoint of achieving water quality standards. However, the regulations do not create any mechanisms for controlling nonpoint sources (except for urban runoff) to the degree that point sources are controlled under existing regulations.

EPA WATERSHED MANAGEMENT INITIATIVE

EPA has recently initiated the "Watershed Protection Approach" in an effort to deal with water quality issues on a watershed basis. The Watershed Protection Approach is not a federal regulatory program in the traditional sense. Rather, it is an attempt by EPA to coordinate existing regulatory programs for the purpose of promoting basin-wide water quality planning and management, and to encourage broad participation in federal, State and regional water quality management plans. The main elements of the Watershed Protection Approach are said to include information transfer, technical tools and assistance, and resource support from existing EPA funding sources [EPA, 1991].

The Watershed Protection Approach demonstrates EPA's understanding that—because of the promulgation of water quality-based standards (pursuant to the 1987 Clean Water Act Amendments)—pollutant dischargers within a given watershed can no longer be viewed in isolation of one another, and that nonpoint sources require increased attention from the standpoint of meeting watershed protection objectives. The Watershed Protection Approach, however, in no way supersedes existing water quality and effluent discharge regulations, which place the burden of achieving water quality standards on point source dischargers.

PROPOSED REAUTHORIZATION OF THE CLEAN WATER ACT

At present, in the U.S. Senate, separate Clean Water Act reauthorization proposals have been released by the Senate Majority and by the Senate Minority. The Senate Majority Clean Water Act reauthorization bill (S. 1081) and the Senate Minority proposal both acknowledge that significant water quality problems still exist around the country, and that nonpoint source pollution is a significant factor in such problems. In addition, both proposals allocate substantial additional resources for existing and proposed Clean Water Act programs for controlling point and nonpoint sources (including urban stormwater runoff and combined sewer overflows). However, neither proposal gives nonpoint sources the level of priority that has already been accorded to point sources under existing Clean Water Act requirements.

A point of divergence between the two proposals appears to be with regard to point source controls. The Majority bill proposes significant modifications to point sources regulations. Such modifications apply to effluent guidelines, toxic pollutant controls, permit fee collection, industrial pretreatment programs, and enforcement programs. The Minority proposal, on the other hand, operates on the assumption that—for the most part—existing regulations regarding point sources are adequate, and that problems exist with enforcement only. The Minority proposal also puts a more explicit emphasis on watershed-based planning and nonpoint source reductions as a means of achieving water quality standards. The nonpoint source provisions of the Minority bill include mandatory implementation of BMPs, establishment of pollutant discharge reduction targets, and development of an incentives program to encourage such reductions. The watershed planning provisions include development of watershed management plans over a five year period and compliance with water quality standards in phases over a fifteen year period (depending on the degree of watershed impairment).

CONCLUSIONS

The current Clean Water Act and implementing regulations have placed significant emphasis on watershed management; emphasis that, on the surface should have been sufficient. What has happened, however, is that the various watershed planning efforts required under the Act (continuous and areawide planning) have failed to accomplish what Congress intended (i.e., compliance with water quality standards). To some extent this is a manner of timing -- the planning was initiated (and completed in the case of Section 208 areawide planning) before the water quality standards for toxic pollutants were adopted. To a larger extent, however, the failure is because the tools do not exist to control the major sources to toxics pollutants to our watersheds (i.e., we have neither the technology, the resources, nor the regulatory programs to effectively control nonpoint sources).

The combined effect of the Act and EPA's current TMDL approach is that watershed planning and water quality regulations tend to focus primarily on controlling point sources even though, by most reports, nonpoint sources are the primary cause of water quality standards violations. As stated in existing EPA guidance for TMDL development.[1]

> "Under the [Clean Water Act], the only federal enforceable controls are those for point sources through the NPDES permitting process. In order to allocate loads among both nonpoint and point sources, there must be reasonable assurances that nonpoint source reduction will in fact be achieved. Where there are not reasonable assurances, under the [Act], the entire load reduction must be assigned to point sources."

1 "Guidance for Water Quality - Based Decisions: The TMDL Process," EPA440/4-91-001, April 1991, p.15.

Carrying the present Act to its logical conclusion will likely result in many situations like the Sacramento example described in the following section. Point source discharges will be required to implement costly end-of-the-pipe controls to meet water quality-based effluent limits, but these enormous expenditures will result in little, if any, environmental benefit.

While Congress and EPA appear to recognize that increased emphasis must be placed on both watershed management and nonpoint sources, current proposals for amending the Clean Water Act and EPA's new Watershed Initiative fall short of what is needed. Each calls for increased attention, but neither promises to provide what is lacking -- the technology, the resources and the regulatory programs to control nonpoint sources. Lacking ***significant*** changes to how the nation deals with nonpoint sources, watershed management is likely to remain only a catchword; and point sources will continue to be placed in the untenable position of carrying the burden (and the cost) for standards violations which are largely due to nonpoint sources. Unless nonpoint sources are effectively controlled water quality standards in most of the nation's waters will never be achieved.

Tri-TAC Water Committee

Section 3

Sacramento River Watershed

August 1992

SECTION 3

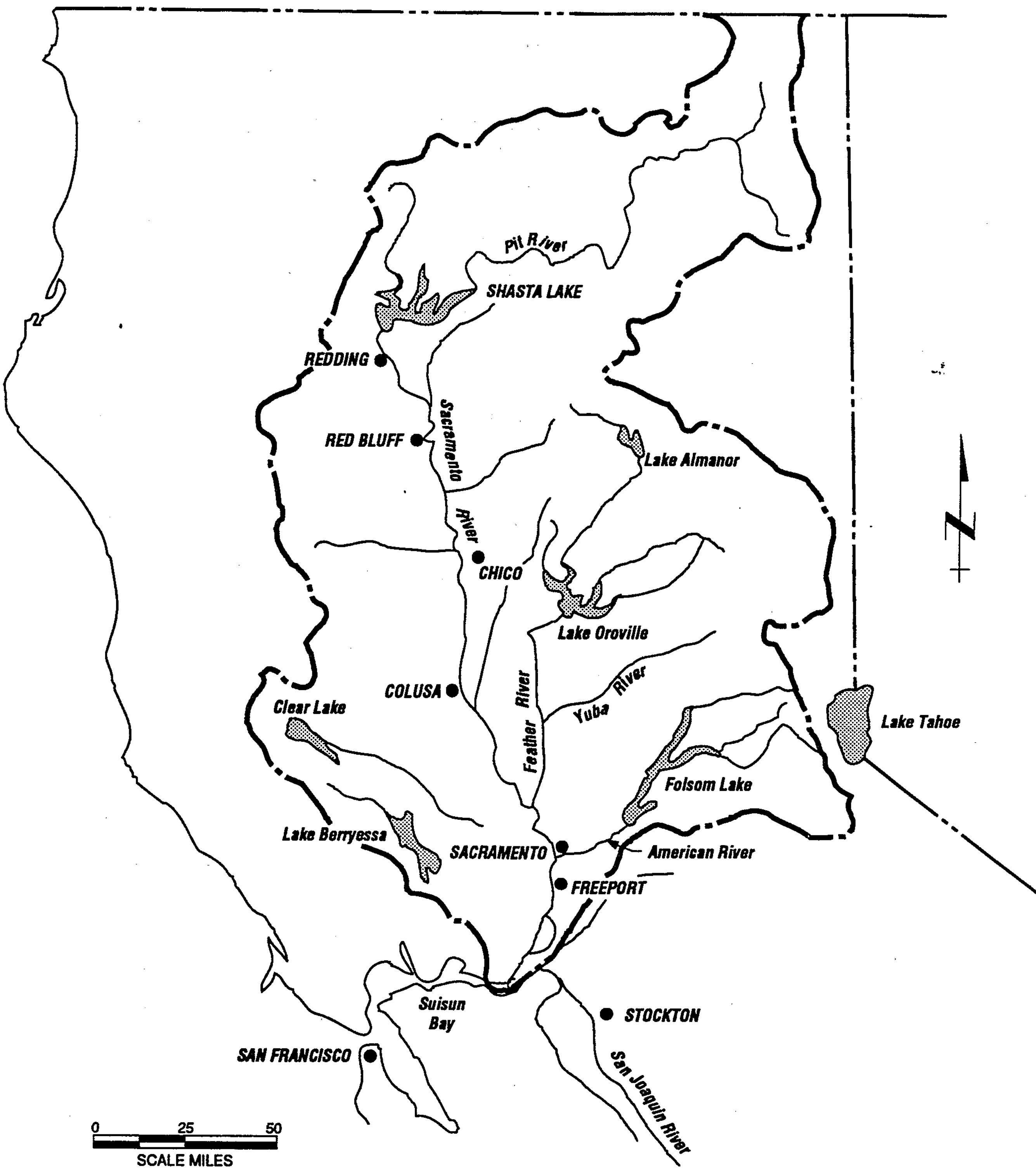
SACRAMENTO RIVER WATERSHED

The purpose of this section is to introduce a particular watershed (that of the Sacramento River) and to demonstrate how current regulations will be applied. The next section of this paper presents Tri-TAC's approach to controlling toxics in the Sacramento River watershed area. If current regulations are fully implemented, point source dischargers to the Sacramento River will have to construct costly treatment upgrades, which are not likely to result in significant improvements in water quality. In the haste to meet federal compliance schedules, no State policy has emerged requiring the evaluation of priorities for expenditure of public funds to achieve water quality objectives. This Sacramento River example makes it clearly evident that diverting public funds to control nonpoint sources may be a more promising avenue than additional point source controls for accomplishing significant improvements in riverine water quality. Further, this case has wide relevance because, as stated in the introduction, nonpoint sources generate a significant contribution to pollutant loading throughout the State, and, indeed, across the nation. The Sacramento River is not a unique case.

PROFILE OF THE SACRAMENTO RIVER

The Sacramento River drains a 26,146 square mile basin that spans the Central Valley of California from the crest of the Sierra Nevada Mountains to the crest of the Coast Range (see Figure 3-1). The river flows primarily in a southerly direction, originating in headwaters near Mt. Shasta and draining into the Sacramento-San Joaquin Delta below the City of Sacramento. Approximately 80 percent of the freshwater reaching the Delta originates from the Sacramento River watershed north of the Town of Freeport. Major features of the watershed are the following:

- **Flow Regimes.** River flows have varied from approximately 3 to 38 million acre feet over the last fifteen years (1976-90). This wide range results from the variable annual rainfall within the Sacramento River watershed and is seasonally controlled through operation of upstream control structures; principally Shasta Dam on the Sacramento River, Oroville Dam on the Feather River, and Folsom Dam on the American River.



SACRAMENTO RIVER WATERSHED

FIGURE 3-1

- **Ambient Water Quality.** Water in the Sacramento River is generally of high quality, as reflected in the wide variety of beneficial uses supported by the river. Riverine water can be broadly characterized as having low hardness (43 - 85 mg/l $CaCO_3$, a wide concentration range of total suspended solids (4 - 720 mg/l) over the past 15 years, and moderate levels of total organic carbon.

  A review of metals data for the river over the last five years indicates that copper concentrations are consistently near or above the EPA criterion continuous concentration (CCC). Concentrations of cadmium, lead, mercury, and zinc occasionally exceed the CCC. Trace elements in the river are predominantly in the undissolved form. Undissolved fractions range from 50 to 95 percent of the trace element concentration.

  Data for synthetic organics and other priority pollutants are sparse for the Sacramento River. Monitoring by the California Department of Water Resources and the Sacramento Regional County Sanitation District (SRCSD) have shown that while pesticides have been measured in agricultural return flows and in fish tissue analyses, they were generally undetectable in the river itself.

- **Biological Resources.** The Sacramento River supports a diverse variety of aquatic organisms and other wildlife. The river provides habitat and migration routes for anadromous and other migratory fish species (sturgeon, chinook salmon, steelhead, trout) and permanent habitat for resident fish species (catfish, Delta smelt, threadfin shad). Numerous species of mammals, birds, reptiles, amphibians, and plants are present, but the abundance of most of these is limited by the availability of suitable habitat.

  A number of species found in the Delta and in the Sacramento River near Freeport are considered rare, threatened or endangered (see Table 3-1). The listed birds, plants, and amphibian species appear to be limited primarily by the degradation or destruction of habitat. None currently appear to be threatened by water quality conditions in the Sacramento River or Delta. The decline of the listed fish species are considered to be primarily due to low water flows and diversions, loss of habitat, and legal and illegal harvest of adults. Although water quality in the lower Sacramento River has not been considered to be a significant cause of their

TABLE 3-1

THREATENED AND ENDANGERED SPECIES PRESENT IN THE LOWER SACRAMENTO RIVER AND DELTA REGION
(California Department of Fish and Game 1990)

Common Name	Scientific Name	Status: California	Status: Federal
Birds	*Haliaaectus leucocephalus*	Endangered	Endangered
Bald eagle	*Buteo swainsoni*	Threatened	Threatened
Swanson's hawk	*Lateralus jamaicensis coturniculus*	Threatened	Candidate
California black rail	*Grus canadensis tabida*	Threatened	
Greater sandhill crane	*Coccyzus americanus occidenialis*	Endangered	Candidate
Western yellow-billed cuckoo	*Riparia riparia*	Threatened	
Bank swallow	*Vireo bellii pusillus*	Endangered	Endangered
Least Bell's vireo			
Reptiles			
Giant garter snake	*Thamnophis couchi gigas*	Threatened	Candidate
Fishes			
Winter run chinook salmon	*Onchorhynchus tshawyischa*	Endangered	Candidate
Delta smelt	*Hypomesus transpacificus*	Candidate	Candidate
Plants			
Soft bird's beak	*Cordylanthus mollis spp. miollis*	Rare	Candidate
Contra Costa wallflower	*Erysimum capitatturrn var. angusiaium*	Endangered	Endangered
Bogg's Lake hedge-hyssop	*Gratiola heterosepala*	Endangered	Candidate
Mason's liaeopsis	*Lilaeopsis masonii*	Rare	Candidate
Slender Orcutt grass	*Orcuttia tenuis*	Endangered	Candidate
Sacramento Orcutt grass	*Orcuttia viscida*	Endangered	Candidate
Greene's Orcutt grass	*Tuctoria greenei*	Rare	Candidate
Crampton's rucioria	*Tuctoria mucronia*	Endangered	Endangered

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decline, pollutant concentrations may contribute to environmental stresses on these species.

NEED FOR WATERSHED MANAGEMENT APPROACH

The need for a watershed management approach for reducing toxic pollutants in the Sacramento River is best exemplified by an evaluation of the sources of metals and possible measures for controlling metals concentrations in the river.

Sources of Metals

The California Regional Water Quality Control Board, Central Valley Region (CVRWQCB) has been investigating the contribution of metals from various sources for a number of years: NPDES sources (POTWs and industries), mines, urban runoff, and agriculture. Their investigation concludes that the predominant source of copper (84%), cadmium (89%), and zinc (91%) is from acid mine drainage; nickel (61%) and chromium (60%) is from agricultural discharges; and lead (93%) is from urban runoff. While the CVRWQCB is continually updating this information, it is clear that the traditionally unregulated nonpoint sources--mines, agriculture, and urban runoff--are the primary sources of these pollutants. POTWs and industrial sources constitute relatively minor or insignificant sources (chromium 11%, nickel 12%, zinc 1%, copper 2%, lead 2%, and cadmium 1%).

Control of Point Sources

The Sacramento Regional Wastewater Treatment Plant (SRWTP) undertook an attainability analysis to determine the nature and costs of the additional controls necessary to comply with the numerical water quality objectives for metals adopted in April 1991 by the State of California. The results concluded the following:

- The existing SRWTP discharge would be in violation of water quality objectives for cadmium, copper, mercury and zinc.

- Even by retrofitting the Regional Plant with a $1 billion treatment system consisting of lime precipitation and reverse osmosis, the plant would not meet water quality objectives for copper and mercury.

- Water quality conditions in the Sacramento River are dominated by nonpoint sources upstream of Sacramento (e.g., mine drainage and agricultural runoff). These discharges are responsible for the river consistently exceeding water quality objectives for cadmium, copper, mercury, and zinc. In fact, the existing Regional Plant discharge has no appreciable effects on metals concentrations in the Sacramento River. As a result, no amount of additional treatment at the Regional Plant will measurably improve water quality in the Sacramento River.

Control of Nonpoint Sources

With the exception of lead, the major sources of all metals in the Sacramento River are upstream nonpoint sources. Consequently, the only means by which water quality objectives can be achieved in the river is to significantly reduce contaminant discharges from upstream nonpoint sources, namely mine drainage and agricultural runoff. The Sacramento urbanized area is at the lower end of the watershed, and although the CVRWQCB data indicates it is the major source of lead, the metropolitan area contributes a minor proportion of the other metals. Therefore, if technically feasible, efforts spent at reducing loading from mines and agriculture will incur a greater benefit to more of the watershed than will control measures in the Sacramento area with a similar level of funding.

CONCLUSIONS

The Sacramento River watershed provides an example of where the control of point sources will have little or no impact on the attainment of water quality objectives. The only means by which water quality objectives can be achieved in the river is to significantly reduce upstream nonpoint source discharges (such as mine drainage and agricultural runoff). The federal and State regulatory programs have focused on point source discharges (POTWs and industries), and with minor exceptions, have done little to address contaminants from nonpoint sources. While this may have been appropriate in the past when dealing with more traditional pollutants such as BOD and TSS, this strategy is not effective for reducing toxic compounds. A new approach is needed to identify the sources of these pollutants, refocus the regulatory efforts on reducing major contributions, and to develop a comprehensive program to utilize the limited public resources to achieve the greatest environmental good.

Tri-TAC Water Committee

Section 4

Proposed Approach

August 1992

SECTION 4

PROPOSED APPROACH

Tri-TAC and its member agencies support the goals of the CWA to control toxic pollutants as necessary to protect beneficial uses of the nation's waterways. Tri-TAC supports the concept defined by Section 303(c)(2)(B) of the 1987 CWA to establish numeric limits for toxic pollutants in water bodies, as long as these limits are scientifically based and are established for site specific conditions particular to each water body.

As previously explained, the CWA and corresponding EPA guidance documents focus on point sources to control the levels of toxic pollutants. This approach is taken despite the fact that water quality standards typically are not achieved due to the discharge of pollutants from nonpoint sources. Tri-TAC's strong disagreement with this approach is the reason for this paper.

GENERAL APPROACH

Tri-TAC's approach to toxics control is to consider all sources of toxic pollutants entering a water body from the entire watershed area and to focus on the source or sources that can most effectively be reduced to achieve compliance with water quality standards (WQSs) in that water body. In some cases this may mean that effluent limitations and related control strategies should be placed on point sources, but many times it will mean that the focus of toxics control should be nonpoint sources instead of point sources. In her presentation of the "National Water Quality Inventory: 1990 Report to Congress," EPA's Assistant Administrator of Water, La Juana Wilcher, confirmed that efforts to upgrade and construct municipal sewage treatment plants has resulted in a marked decline in pollution from point sources, but that wet weather runoff, including storm water and nonpoint source discharges, is the most significant remaining threat to U.S. ground and surface water quality.[1]

The watershed management approach being recommended by Tri-TAC in this paper consists of the following major elements:

- Delay Numeric Limits in NPDES Permits
- Establish Site Specific Water Quality Objectives as Appropriate

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1 EPA's "National Water Quality Inventory: 1990 Report to Congress" as reported in The Bureau of National Affairs, March 18, 1992.

- Implement Water Quality Monitoring
- Implement Minimum Standards of Operation for All Significant Pollutant Sources
- Develop Total Maximum Daily Loads (TMDLs)
- Allocate Pollutant Loadings Based on a Risk Analysis

Each of these elements are discussed in the paragraphs below.

Delay Numeric Limits in NPDES Permits

As previously indicated, Tri-TAC agrees with the concept of establishing numeric water quality objectives for toxics in each water body. However, these objectives should not be translated into effluent limits in the NPDES permits of point source dischargers unless all of the following conditions apply:

- The quality of the receiving water does not meet WQSs (either outside the zone of initial dilution at the point of discharge or downstream of the point of discharge)

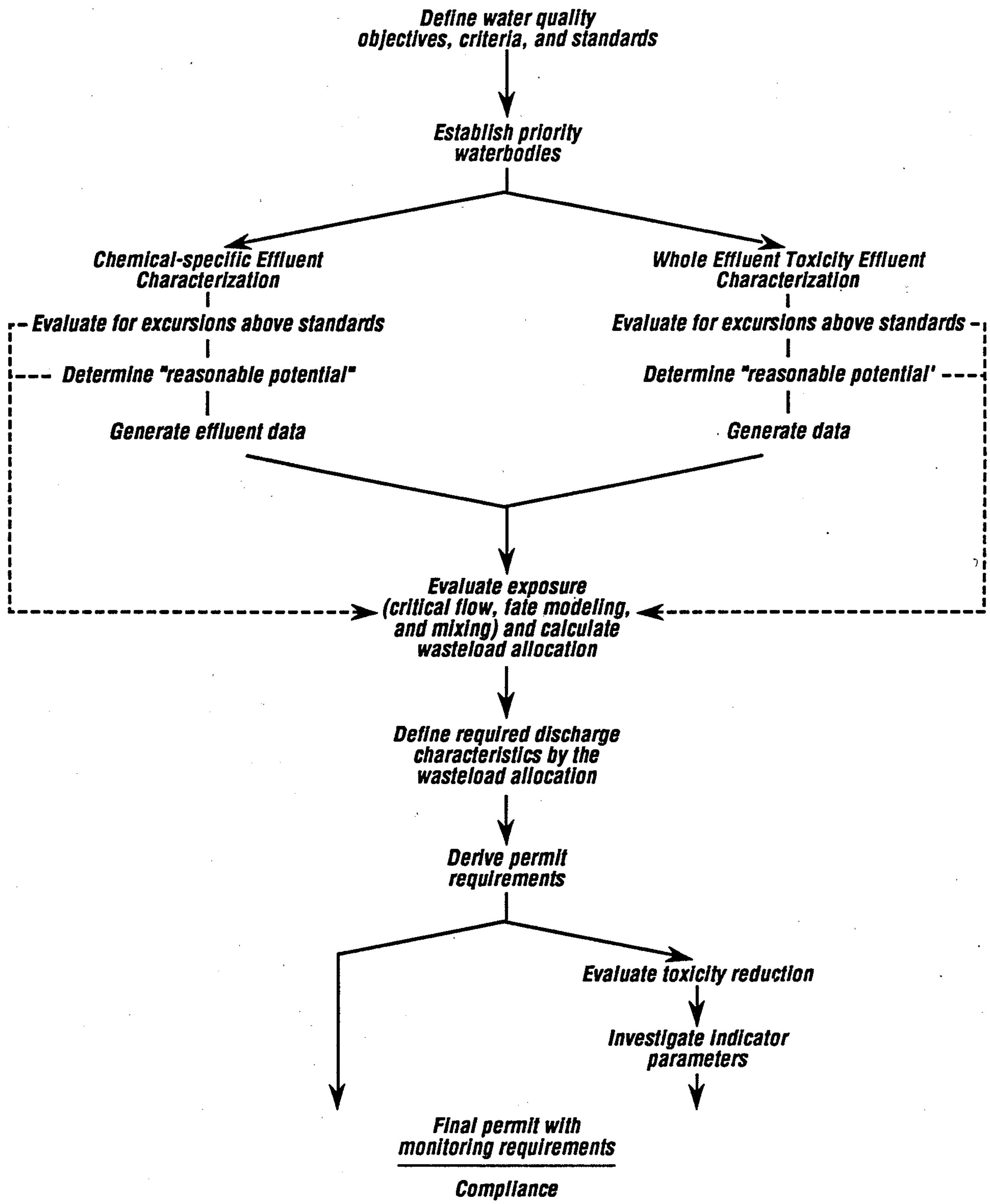
- TMDLs and WLAs have been developed for the receiving water

- Reduction of pollutants from the point source has been shown to be a high priority component of a watershed management plan to achieve compliance with WQSs.

The idea of developing TMDLs and WLAs prior to establishing permit limits has been introduced in EPA's "Technical Support Document for Water Quality - Based Toxics Control".[2] As indicated on Figure 4-1 and as described on page 1 of that document, "... Chemical-specific water quality-based limits in NPDES permits involve a site-specific evaluation of the discharge and its effect upon the receiving water. This ***may*** include collection of effluent and receiving water data and result in the development of a wasteload allocation (WLA) and a total maximum daily load (TMDL) through modeling, a mixing zone analysis, and the calculation of permit limits..."

The key word in the above paragraph, however, is "may" which has been italicized. Based upon the direction being taken in California, with the 1991 State Water Quality Control Plans for Inland Surface Waters and Enclosed Bays and Estuaries, the development of permit limits will not include an evaluation of TMDLs or development of WLAs. In fact, to our knowledge, in California the

2 "Technical Support Document for Water Quality-Based Toxics Control," EPA Office of Water, EPA/505/2-90-001, March, 1991



OVERVIEW OF THE WATER QUALITY-BASED "STANDARDS TO PERMITS" PROCESS FOR TOXICS CONTROL*

FIGURE 4-1

* Taken from "Technical Support Document for Water Quality-Based Toxics Control"
EPA/505/2-90-001
March, 1991.

development of TMDLs and WLAs are is currently only planned for those waters included on one of the Section 304(l) lists, which are lists of water quality impaired waters to be submitted to EPA by the States on a "one time only" basis.

Establish Site Specific Water Quality Standards As Appropriate

Development of site specific water quality standards is an important tool for scientifically adjusting laboratory-derived national criteria so that they are protective of local aquatic ecosystems. Water quality criteria developed by EPA are intended to reflect a level of protection sufficient to maintain balanced, indigenous populations in aquatic ecosystems. However, these criteria may be either under- or overprotective for some local conditions. For example, the characteristics of the receiving water may impact the bioavailabiltiy of contaminants, sensitive species may not be encountered in local water bodies, or a species may have acclimatized to elevated levels of a contaminant at certain sites. The Water Quality Standards Handbook[3] provides guidelines for developing site specific water quality criteria for two conditions:

- The species at a particular site may be more or less sensitive than those included in the national criteria database, and/or

- The physical and/or chemical characteristics of the water at a particular site may alter the biological availability and/or toxicity of the material.

EPA has developed three procedures for deriving site specific criteria, which are explained in more detail below:

Recalculation Procedure. The Recalculation Procedure compensates for different sensitivity ranges of species in the national data set and local species. This methodology eliminates data for species that do not exist at a specific site. If, after eliminating irrelevant data, the database no longer satisfies the minimum national requirements, additional laboratory toxicity data for the untested resident species must be developed prior to recalculating a site-specific criterium.

Indicator Species Procedure. The Indicator Species Procedure accounts for differences in bioavailability and/or toxicity of a constituent resulting from the characteristics of the receiving water, such as hardness, alkalinity, organic solutes, inorganic and organic colloids, salinity, and suspended solids. Toxicity testing is performed on species that are most sensitive to the constituent

3 "Water Quality Standards Handbook" EPA Office of Water Regulations and Standards, 1983

of concern. Then, a ratio of site water toxicity to lab water toxicity is used to modify the national criteria.

Resident Species Procedure. The Resident Species Procedure accounts for both the differences in the sensitivity of the resident species and the impacts of the receiving water characteristics. This methodology requires performing an extensive number of toxicity tests on resident species, so this approach has rarely been employed.

Implement Water Quality Monitoring

Water quality monitoring is typically conducted immediately upstream and downstream of a point source discharge as part of the NPDES permit monitoring requirements. However, toxic pollutants have typically not been analyzed for and, where they have, consistent quality control procedures may not have been in effect from one discharger to another. In order to develop effective programs for compliance with WQSs, comprehensive monitoring programs need to be put into place that accomplish the following objectives:

- Establish background water quality conditions throughout the water body (not just in the area of point source discharges).
- Track changes in water quality conditions based on seasonal variations in flow and improvements in the control of toxic discharges.

Implement Minimum Standards of Operation for All Significant Pollutant Sources

Section 319 of the 1987 CWA required States to prepare assessments of their nonpoint source pollution problems and to identify BMPs to control these problems. Examples of BMPs which could be minimum standards of operation for nonpoint sources are provided in Table 4-1. Tri-TAC's approach includes the concept that, where standards are violated, all significant sources of toxic pollutants should be required to implement minimum standards of operation. This approach requires the following:

- States should expedite development and implementation of best management practices (BMPs) for the control of toxics from traditional nonpoint sources, including urban runoff.

TABLE 4-1

EXAMPLES OF BEST MANAGEMENT PRACTICES FOR NONPOINT SOURCES*

AGRICULTURE

Animal waste management
conservation tillage
Contour farming
Contour strip cropping
Cover crops
Crop rotation
Fertilizer management
Integrated pest management
Livestock exclusion
Range and pasture management
Sod-based rotations
Terraces

CONSTRUCTION

Disturbed area limits
Nonvegetative soil stabilization
Runoff detention/retention
Surface roughening

URBAN RUNOFF

Porous pavements flood storage
Runoff detention/retention
Street cleaning

SILVICULTURE

Ground cover maintenance
Limiting disturbed ares
Log removal techniques
Pesticide/herbicide management
Proper handling of haul roads
Removal of debris
Riparian zone management
Road and skid trial management

MINING

Block-cut or haul-back
Underdrains
Water diversion

MULTICATEGORY

Buffer strips
Detention/sedimentation basins
Devices to encourage infiltration
Grassed waterway
Interception/diversion
Material ground cover
Sediment traps
Streamside management zones
Vegetative stabilization/mulching

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*Source: "Guidance for Water Quality-Based Decisions: The TMDL Process" EPA 440/4-91-001, April, 1991.

- POTWs and industries should be required to implement minimum standards of operation.

For POTWs minimum standards of operation should include the following:

- Compliance with current EPA pretreatment program requirements.

- Assessment of sources of toxic pollutants (i.e. industrial, commercial, residential water supply)

- Implementation of waste minimization programs to address significant sources of toxic pollutants for each source.

Examples of waste minization techniques for POTW and industrial sources of toxics are provided on Figure 4-2.

Develop TMDLs

The TMDL process was established by Section 303(d) of the CWA and described in detail in EPA's accompanying guidance document.[4] Tri-TAC endorses the use of the TMDLs and WLAs to establish the allowable loadings to a water body and the relationship between all pollutant sources and water quality. As explained later in this section, we recommend that more emphasis should be placed on the relative impacts of pollution control strategies, and that controls should be placed on nonpoint sources rather than point sources if the TMDL process shows that WQSs can most effectively be met by control of nonpoint rather that point sources of toxics.

Allocate Pollutant Loadings Based on a Risk Analysis

The TMDL process determines the maximum total allowable mass of a pollutant that can be discharged at various locations and various times of the year without causing violations of the WQSs for the particular water body. As previously explained, the approach now in effect requires that there must be reasonable assurances that loadings from nonpoint sources will be achieved or "... the entire load reduction must be assigned to point sources..."[5] As stated above, Tri-TAC's position is that, through the TMDL process, activities should be directed toward those sources

4 "Guidance for Water Quality-Based Decisions: The TMDL Process," EPA 440/4-91-001, April 1991.
5 IBID, p. 15.

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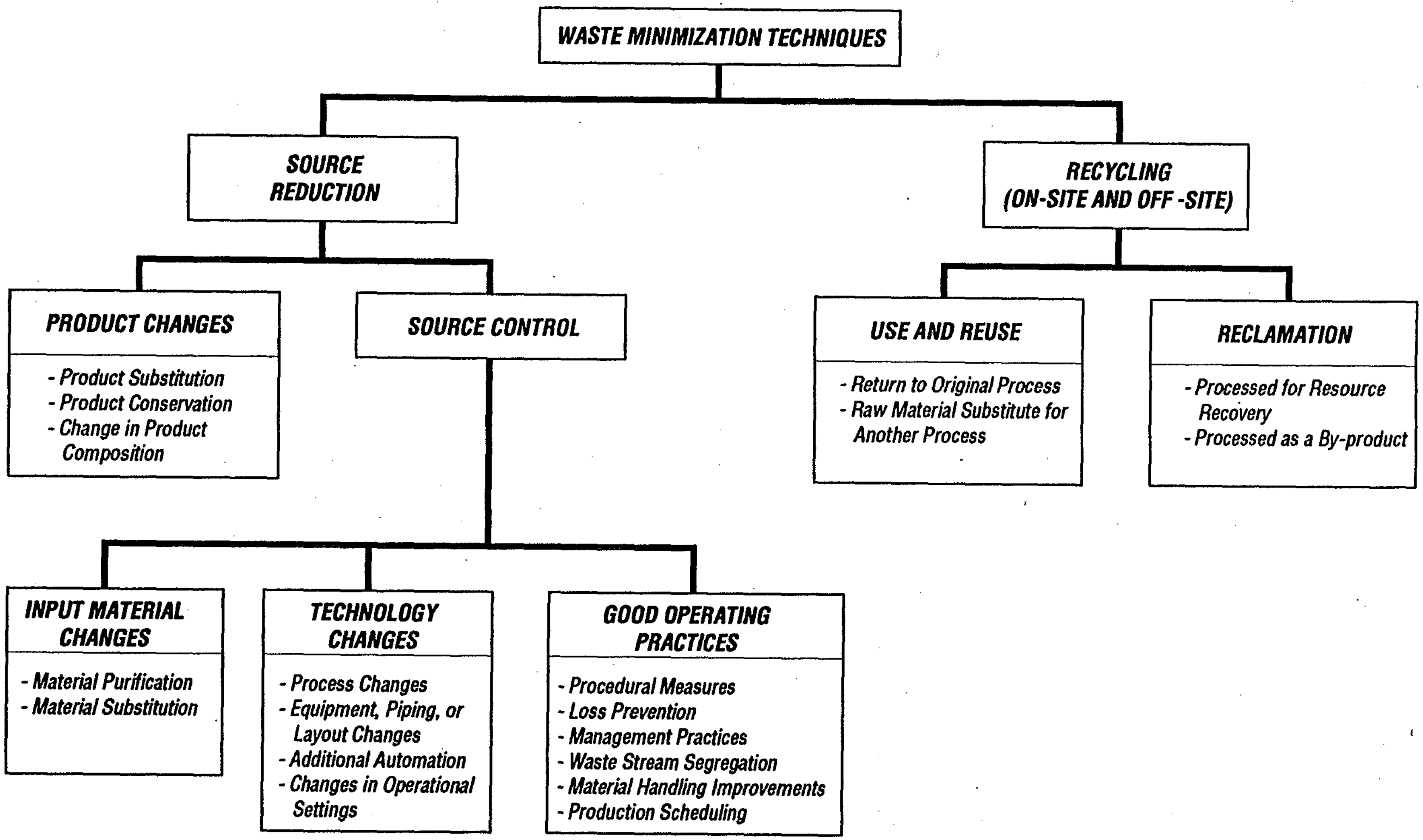

* TAKEN FROM EPA WASTE MINIMIZATION OPPORTUNITY ASSESSMENT MANUAL

WASTE MINIMIZATION TECHNIQUES*

FIGURE 4-2

position is that, through the TMDL process, activities should be directed toward those sources which provide the greatest opportunity for water quality improvement, irrespective of whether the sources are point or nonpoint. From a risk standpoint, those sources which pose the greatest risk for a water body's compliance with WQSs should be targeted for control.

TMDL PROCESS

The TMDL process as defined by the CWA and detailed by EPA is shown on Figure 4-3 This water quality-based approach to pollution control involves five major steps:

1. Identification of Water Quality-Limited Waters
2. Priority Ranking and Targeting
3. Development of TMDLs
4. Implementation of Control Actions
5. Assessment of Water Quality-Based Control Actions

Tri-TAC endorses this basic approach, but with certain modifications to make it consistent with our general watershed management approach. These modifications are highlighted on Figure 4-4. The following additions have been made to the EPA figure:

1.A. Establishment of Site Specific Water Quality Standards
1.B. Development of Minimum Standards of Operation (for point sources (PS) ***and*** nonpoint sources (NPS))
1.C. Implementation of Monitoring Programs and Minimum Standards of Operation
2.A. Formation of Watershed Management Authorities
3.A. Evaluation of Predicted Impacts of Pollution Control Strategies
3.B. Allocation of Pollutant Loadings Based on a Risk Analysis

Most of these additions have been discussed under the General Approach heading of this section. The idea of forming a Watershed Management Authority comes from two changes that we recommend which may require an overall agency approach: moving from a point source focus to an all source focus; and coordination, management, and funding issues for various watershed activities. This agency could be a joint powers authority of point and nonpoint source dischargers, but it may be more appropriate for it to be an existing State agency responsible for NPDES permitting (i.e. the State Water Resource Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) in California).

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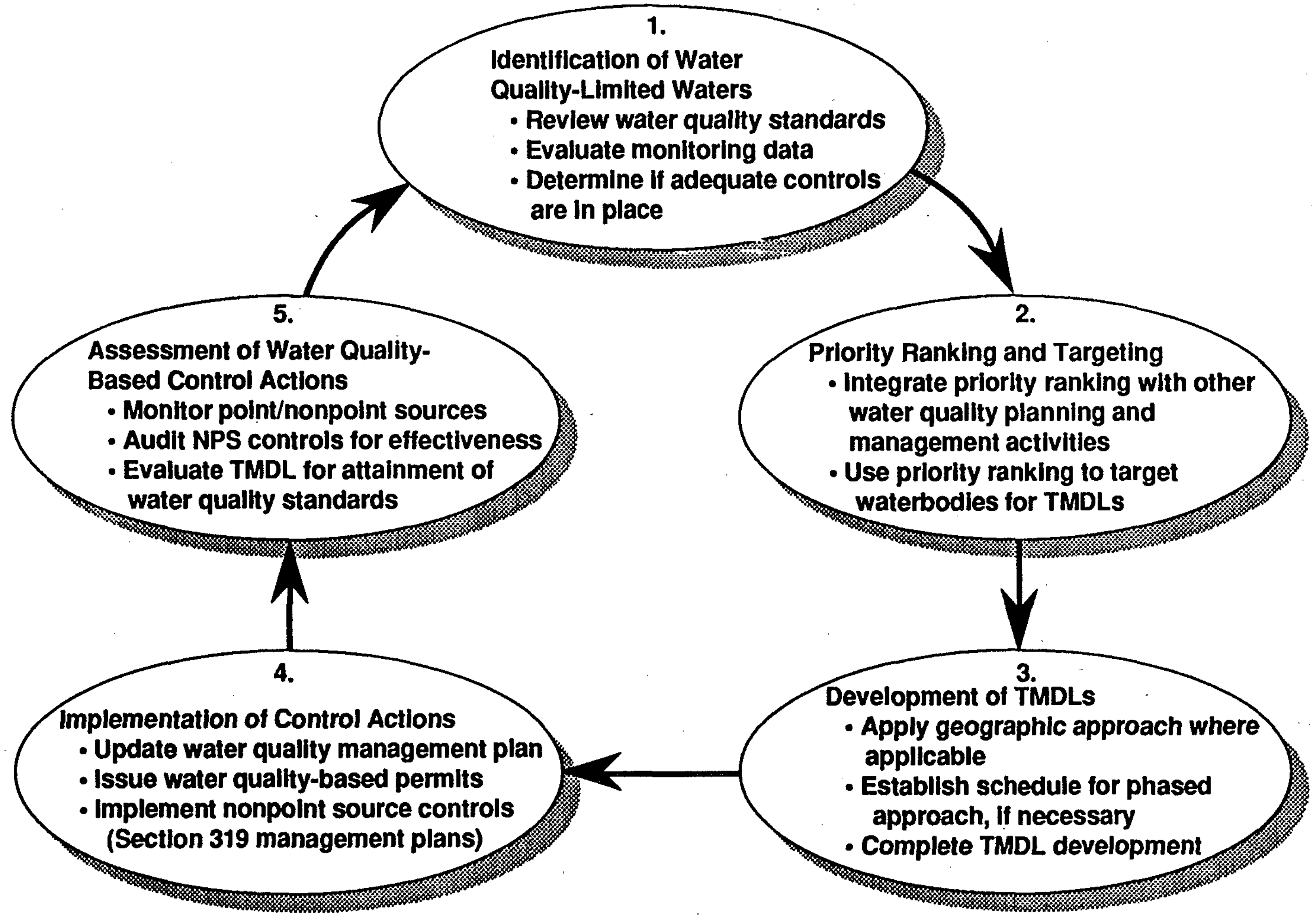
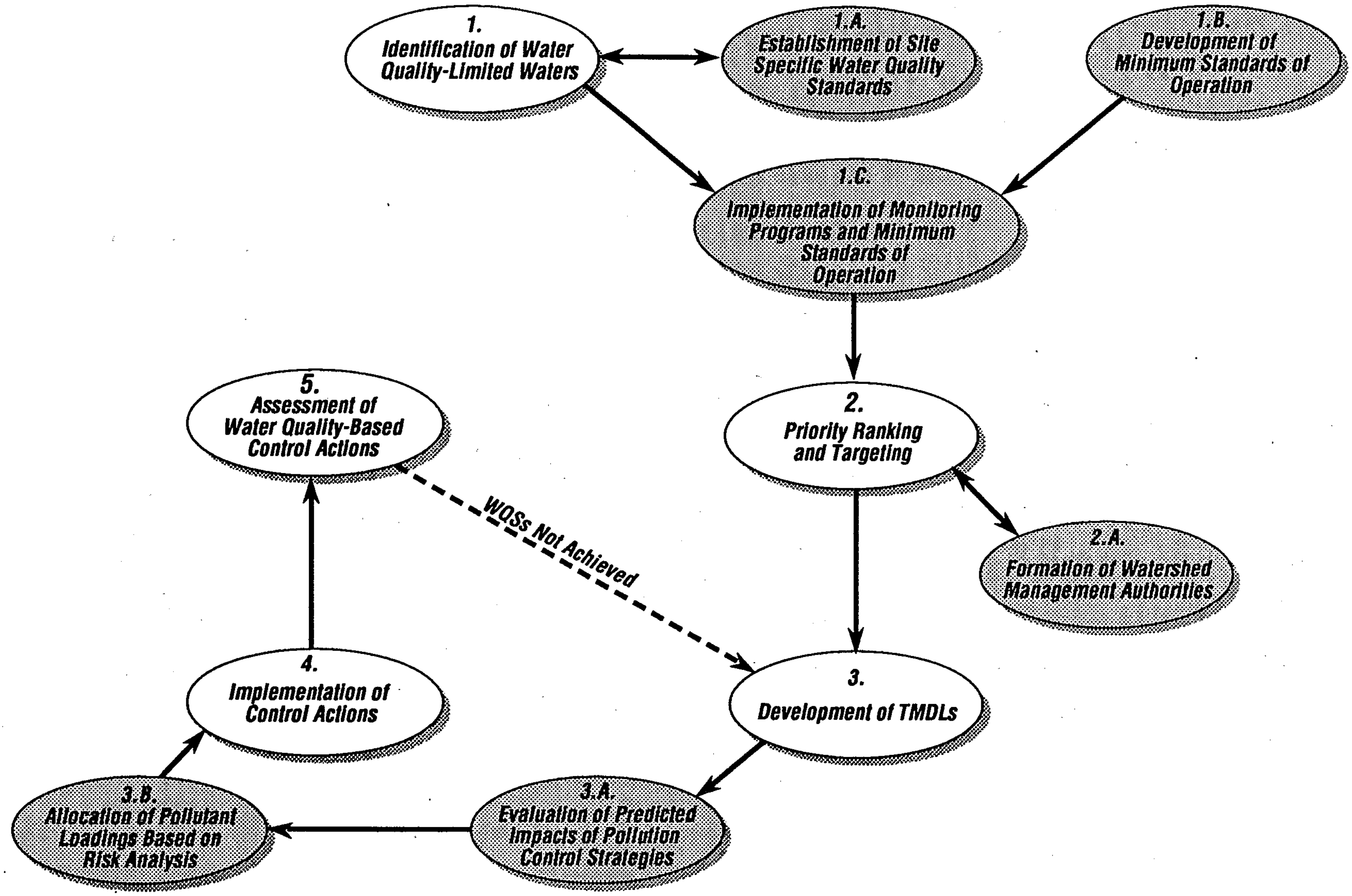


GENERAL ELEMENTS OF THE WATER QUALITY-BASED APPROACH*

FIGURE 4-3

*Taken from "Guidance for Water Quality-Based Decisions: The TMDL Process"
EPA 440/4-91-001
April, 1991



RECOMMENDED REVISIONS TO EPA'S WATER QUALITY-BASED APPROACH

FIGURE 4-4

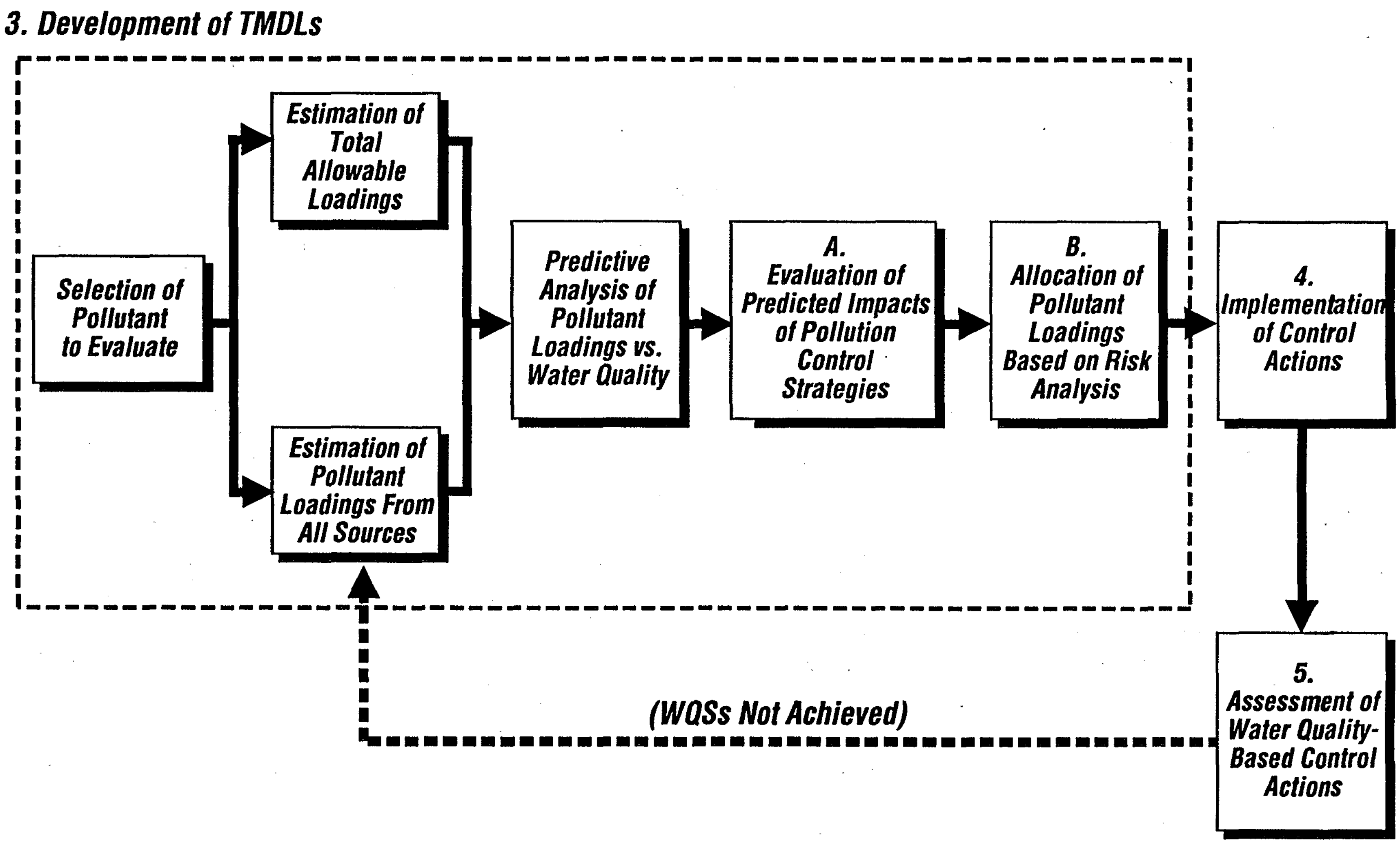
A more detailed presentation of Tri-TAC's concept for Steps 3-5 of the TMDL process is provided on Figure 4-5. As indicated, once estimations are made of the total allowable loadings and the pollutant loadings from specific sources at various times of the year, predictive modeling is conducted to evaluate pollutant loadings vs. water quality . Once the relationship between pollutant loadings and water quality has been established, the impacts of various control strategies can be assessed. Then pollutant loadings can be allocated based upon the predicted effectiveness of various control strategies and the relative risks of noncompliance when one pollutant source is reduced versus another.

APPROACH EXAMPLE

To illustrate how we believe the watershed management approach should be utilized to control toxic pollutants and achieve compliance with WQSs we have developed an example. This example is for the Sacramento River, but for a hypothetical pollutant. Based upon information from the Central Valley RWQCB about levels of metals in the river from various sources (see Section 3), hypothetical pollutant loading curves have been developed for four major sources. This information is presented on Figure 4-6. As indicated, PS 1 is a POTW point source, NPS1 is an urban runoff nonpoint source, NPS 2 is an agricultural drainage nonpoint source, and NPS 3 in acid mine drainage nonpoint source. For this example, the POTW is meant to be the Sacramento Regional Wastewater Treatment Plant (SRWTP) and NPS 1 represents urban runoff from the Sacramento metropolitan area. NPS 2 and NPS 3 are meant to represent all agricultural and acid mine drainage sources collectively. Other smaller dischargers are ignored in this example.

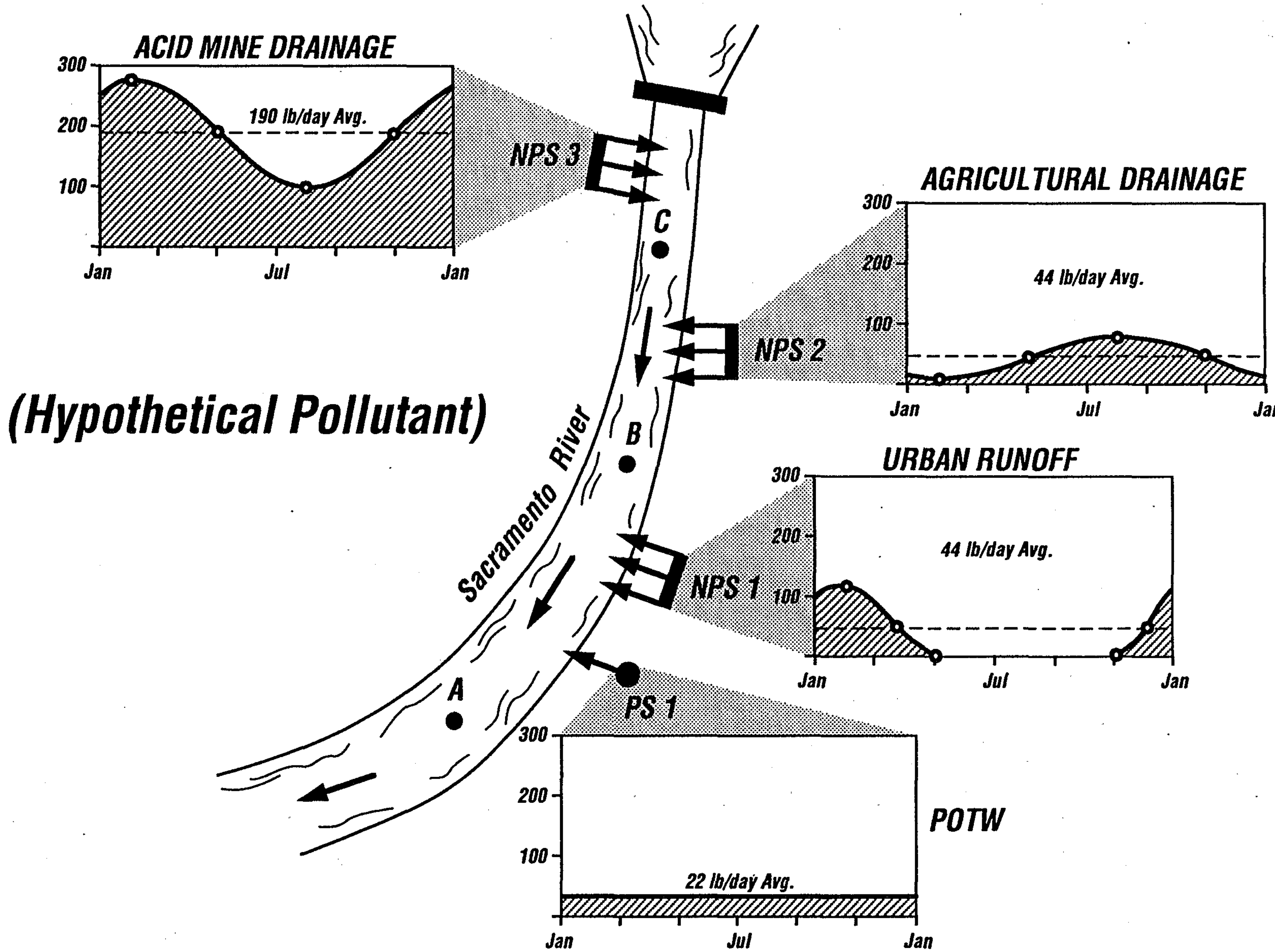
Estimation of Pollution Loadings From All Sources

The pollutant loading information presented on Figure 4-6 is summarized for Stations A, B and C in the Sacramento River in Table 4-2. To simplify the example, the loadings are presented on an average annual basis in Table 4-2 even though an actual TMDL analysis would consider the seasonal variations shown on Figure 4-6. Assumptions are also made in Table 4-2 about the contribution of toxics from sediments on an average annual basis. As expected, all of the sources of pollution contribute to water quality conditions at Station A, but only NPS 2 and NPS 3 contribute at Station B, and only NPS 3 contributes at Station C.



RECOMMENDED APPROACH USING TMDLs

FIGURE 4-5



APPROACH EXAMPLE: SACRAMENTO RIVER WATERSHED

FIGURE 4-6

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TABLE 4-2

ESTIMATION OF POLLUTANT LOADINGS FROM ALL SOURCES
(Hypothetical Pollutant)

Pollutant Source	Pollutant Loadings on Average Annual Basis					
	Station A		Station B		Station C	
	lb/Day	%	lb/Day	%	lb/Day	%
PS 1	22	5.9	0	0	0	0
NPS 1	44	11.7	0	0	0	0
NPS 2	44	11.7	44	16	0	0
NPS 3	190	50.1	190	69	190	90
Sediments	75	20	41	15	21	10
TOTAL	375		275		211	

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Predictive Analysis of Pollutant Loadings vs. Water Quality

Water quality modeling, water body monitoring and pollutant source monitoring will be necessary to establish the relationship between pollutant sources and background concentrations in the river at various locations and for varying weather conditions. Several different mathematical models are available to evaluate alternative pollutant loading scenarios. The EPA Center for Exposure and Assessment Modeling (CEAM) currently supports 21 simulation models and databases for various watershed applications.

Evaluation of Predicted Impacts of Pollution Control Strategies

Using the pollutant source information from Table 4-2, Figure 4-7 was developed for Station A to show the impact of pollutant loading reductions on concentration reductions in the river. As indicated in Table 4-2, the loadings from NPS 3 represents 50 percent of the total loadings impacting background concentrations at Station A. Therefore, if a 25 percent reduction in the background concentration of the hypothetical pollutant is required at Station A to meet WQSs, then this could be achieved by a 50 percent reduction of the pollutant loading from NPS 3. To obtain a 25 percent reduction in the background concentration at Station A by reducing sources other than NPS 3 would require 80 percent reductions of NPS 1, NPS 2 and PS1. These other sources simply do not impact water quality at Station A as much as NPS 3.

Allocation of Pollution Loading Based on a Risk Analysis

To complete the recommended TMDL process, allocations of pollutant loadings should be based on a risk-type analysis. In this example, the risks of non-compliance with WQSs and accompanying toxicity to humans or aquatic biota are less if NPS 3 is controlled. Therefore, priority should be given to the control of NPS 3 and the allocation for NPS 3 should be cut in half, from 190 lb/day to 95 lb/day. Other pollutant loadings in this example would remain the same assuming compliance with WQSs is achieved.

The risk-based evaluation will involve identification of control strategies beyond minimum standards of operation for each pollutant source and a determination of costs and other factors related to implementation of these strategies. The type of analysis required for each source is shown by an example for PS 1 presented on Figure 4-8. This figure provides a plot of costs versus reduction of pollutant loadings for various levels of operation at the SRWTP. The existing level of treatment and source control/waste minimization activities provide about 60 percent

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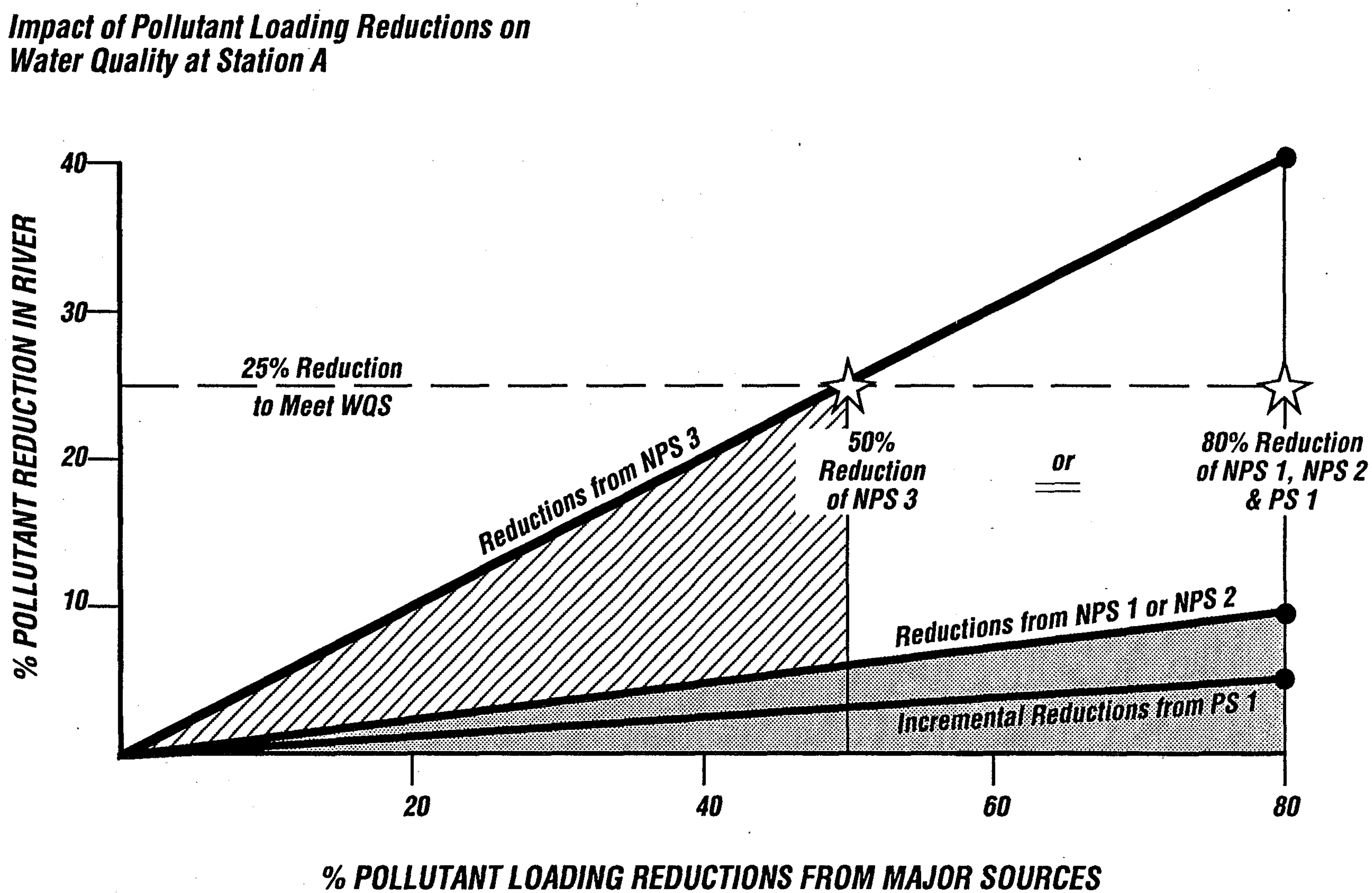
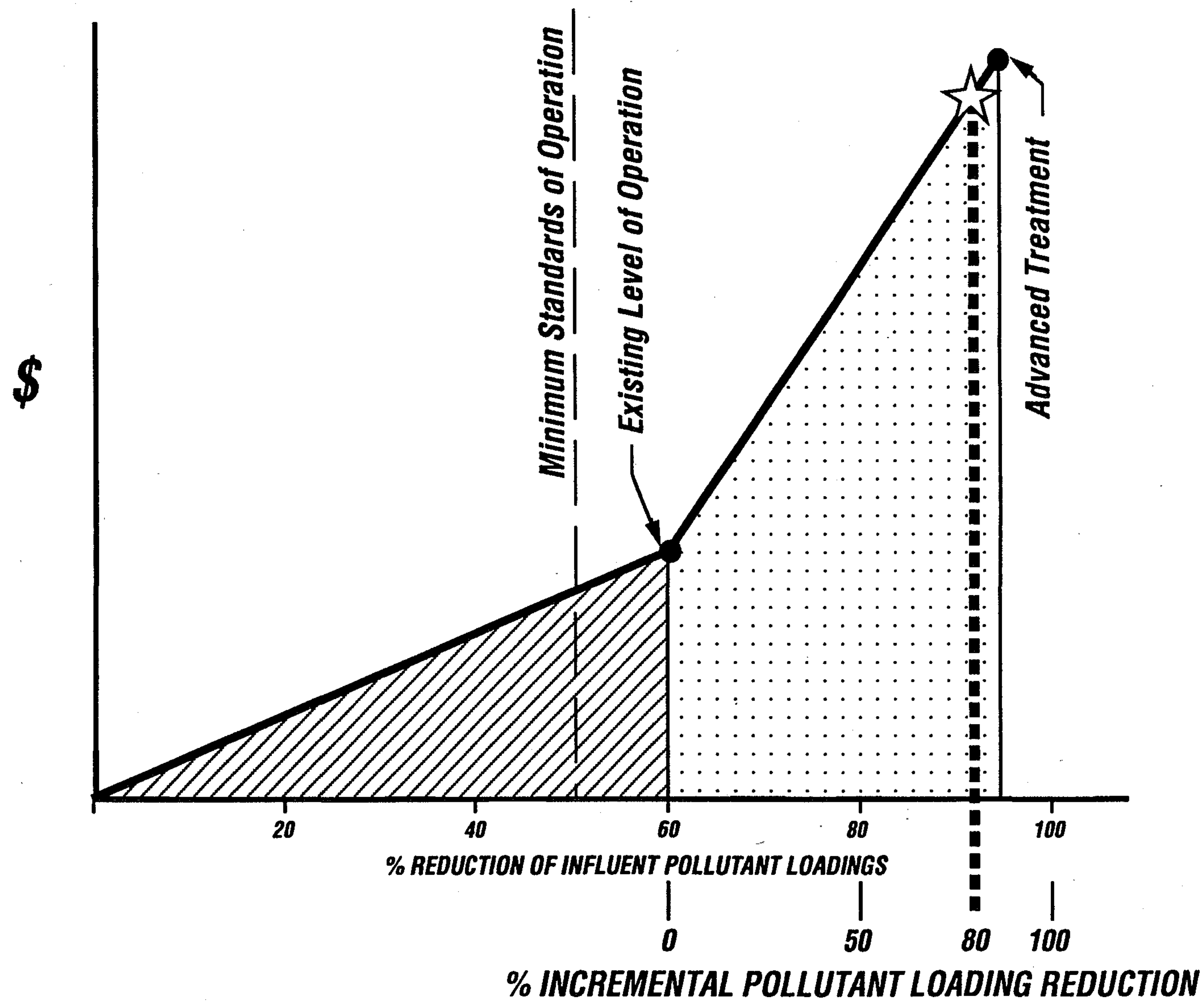


EVALUATION OF IMPACTS OF POLLUTION CONTROL STRATEGIES

FIGURE 4-7



EVALUATION OF COSTS FOR INCREMENTAL POLLUTANT LOADING REDUCTIONS FROM PS 1

FIGURE 4-8

removal of metals on an overall basis. As previously explained for this example, an incremental reduction of 80 percent would be required for PS 1, NPS 1 and NPS 2 to equal the impacts of 50 percent reduction of the pollutant loading from NPS3. As shown on Figure 4-8, an incremental pollutant reduction of 80 percent would require advanced treatment (such as reverse osmosis for most of the plant flow. As previously indicated, this level of treatment would require a capital cost of approximately $1 billion.

Once costs are developed for each source then the total costs for the various control strategies must be compared (see Figure 4-9). In this case, two control strategies were identified as methods to achieve compliance with WQSs, 50 percent reduction of NPS 3 or 80 percent reduction of NPS 1, NPS 2, and PS 1. Assuming the costs and relative risks of non-compliance for the strategy of 50 percent reduction of NPS 3 are less than the costs and risks for the other option, then this control strategy should be adopted.

Public funds can be used more effectively to meet WQSs in the Sacramento River by control of a nonpoint source in this example rather than control of a point source. By fully implementing the watershed management approach this conclusion will ensure that proper controls are placed on nonpoint sources where appropriate, and that point source dischargers are not taking actions that have no impact on water quality.

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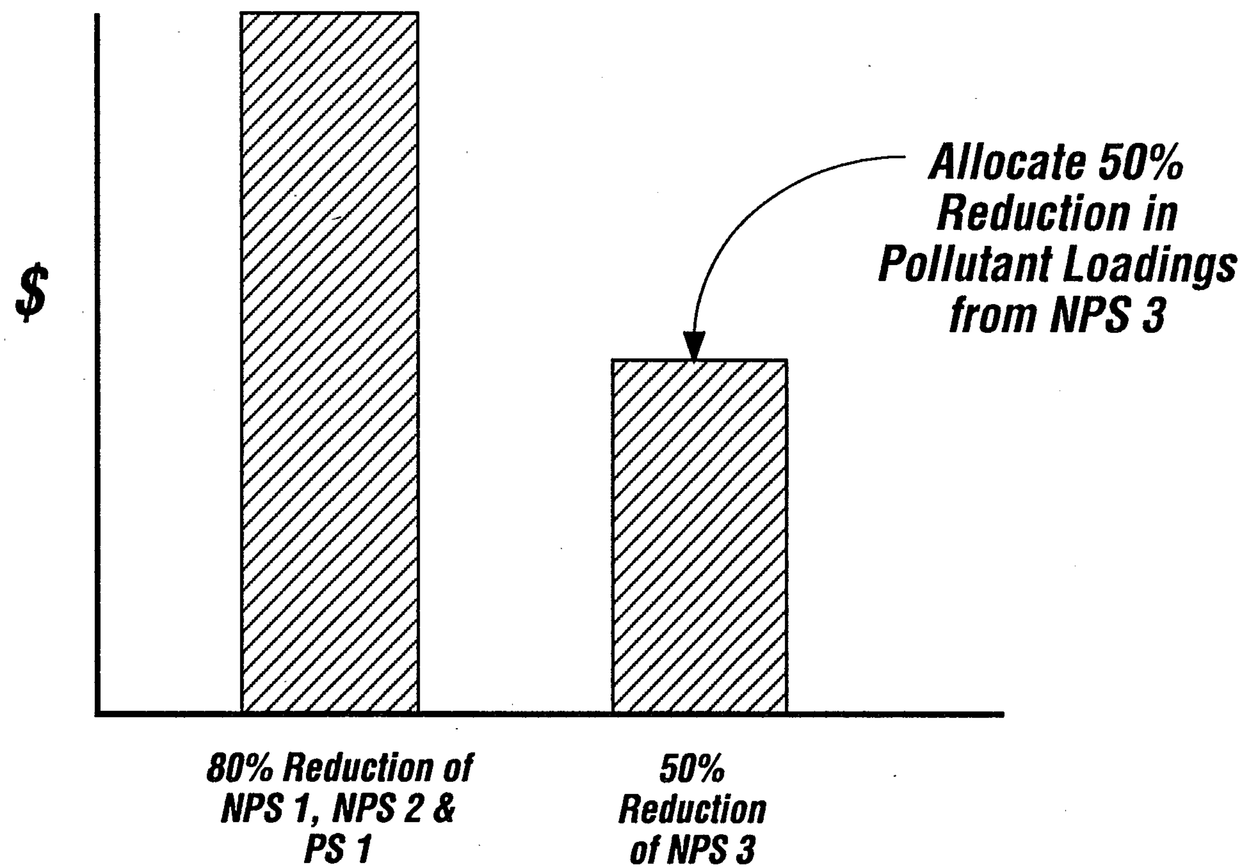

COMPARISON OF COSTS TO PRIORITIZE IMPLEMENTATION OF POLLUTION CONTROL STRATEGIES

FIGURE 4-9

Tri-TAC Water Committee

Section 5

Recommended Actions

August 1992

SECTION 5
RECOMMENDED ACTIONS

To maximize the effectiveness of measures to reduce the concentration of toxic substances in our nation's waters and to expedite the achievement of water quality standards Tri-TAC recommends federal and State adoption of a watershed management approach to toxics control. This approach should include the following major elements:

- **Delay of Numeric Limits in NPDES Permits.** Numeric water quality objectives should be adopted for all navigable waters, but these objectives should not be converted to effluent limits in NPDES permits until watershed management authorities have determined the control of the permitted sources to be a high priority strategy for toxics control.

- **Establishment of Site Specific Water Quality Standards.** It may be appropriate in some water bodies to develop site specific WQSs to scientifically adjust laboratory-derived national criteria for the protection of local aquatic ecosystems.

- **Implementation of Water Quality Monitoring.** Programs should be implemented as soon as possible to assess current water quality conditions and impacts of seasonal variations and improvements in the control of toxic discharges.

- **Development and Implementation of Minimum Standards of Operation.** All significant point sources and nonpoint sources must begin implementing minimum standards of operation to minimize the discharge of toxics to our nation's waterways.

- **Use of Total Maximum Daily Loads.** To determine effective wasteload allocation of point and nonpoint sources the TMDL process should be modified and utilized for all waterways. If this process shows effective control of toxics to be the reduction of nonpoint sources, then the nonpoint sources should be required by NPDES permits to implement the appropriate control measures. (As previously indicated, the 1987 Clean Water Act specifies NPDES permit requirements for urban stormwater discharges. However, other nonpoint sources currently are not required to obtain NPDES permits for their discharges).

To implement this watershed management approach will require the following actions:

- Amendment of the Clean Water Act to establish the Tri-TAC approach and a corresponding schedule for implementation.
- Amendment of the Clean Water Act to require all nonpoint sources to be subject to NPDES permit requirements.
- Amendment of the Clean Water Act to require nonpoint sources to comply with pollutant loading reductions determined by the TMDL process.
- In California, utilization of existing State authority to require nonpoint sources to comply with pollutant loading reductions determined by the TMDL process.
- Establishment of existing State or local agencies as watershed management authorities to assess fees and implement watershed management programs.
- Campaign to inform affected agencies and the public of local watershed management programs.

To gain acceptance of the watershed management approach the Tri-TAC Water Committee now plans to meet with appropriate State and federal agencies and legislators. Member agencies can assist by passing on the merits of the watershed management approach to your respective Boards and the public.

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