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DEVELOPMENT OF A GROSS TOXICITY CRITERION IN SAN FRANCISCO BAY

N. E. ARMSTRONG and P. N. STORRS

Engineering-Science, Inc., 150 East Foothill Boulevard, Arcadia, California, U.S.A.

E. A. PEARSON

University of California, Berkeley, California, U.S.A.

INTRODUCTION

In recent years increasing attention has been given to the development of water quality standards and criteria based on biological considerations. A major objective of most water quality management programs is the protection and enhancement of the aquatic biota. To accomplish this goal, criteria are required to evaluate desirable water quality conditions.

In most cases the purpose of the criteria is to define conditions where the growth of some portion of the biota will not be adversely affected. Limitation of nutrient concentrations to prevent excessive growth of algae is one example. At the other extreme limitation of the concentrations of toxic materials is intended to prevent the inhibition of growth of desirable organisms.

Development of toxicity criteria is based commonly on results of acute bioassays with specific toxicants and using specific organisms. A toxicity criterion is usually expressed as a toxicant concentration that is obtained by multiplying the median lethal tolerance limit (TL_m) by an application factor.

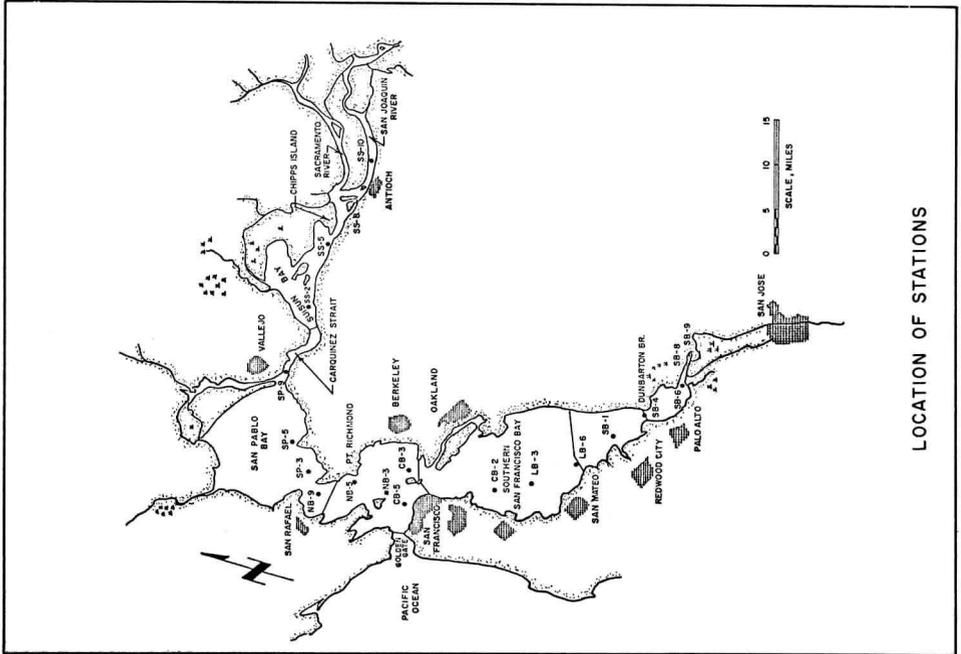
This procedure has a number of difficulties. The possible combinations of organisms to be protected and potential toxicants are very large. New toxicants are appearing almost continuously in the environment. The rational determination of suitable application factors is extremely difficult. There is a serious need for a gross toxicity criterion which can be used in water pollution control to supplement criteria for specific, known toxicants.

APPROACH TO THE PROBLEM

It became evident in the conduct of the San Francisco Bay-Delta Water Quality Control Program (1) that toxicity criteria were needed to plan for control of toxic discharges and that such control measures could not be quantified without relating the toxic characteristics of waste discharges to adverse changes in the aquatic biota. Water quality data collected during the University of California study of San Francisco Bay (2) at the over 50 stations shown in Figure 1 indicated that, according to such parameters as dissolved oxygen and biochemical oxygen demand, water quality in the Bay was very good. Only localized problems occurred, and they were in restricted portions of the Bay. Yet, damage to the biota of the Bay was occurring as evidenced by increasingly frequent fish kills and historical decreases in fish populations. Since the purpose of the Program was to develop a water pollution control program for the Bay-Delta, a rational approach to controlling waste discharges had to be found such that the biota and the recreational uses it represented could be protected.

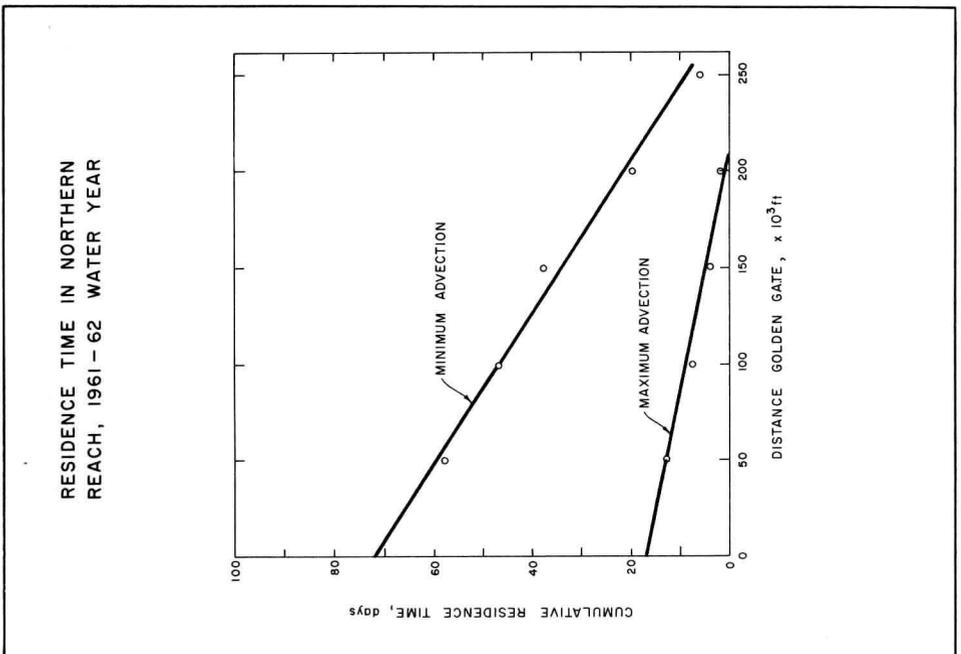
The approach taken was to characterize the wastes being discharged to San Francisco Bay-Delta and to determine the mass discharge of toxicity and other constituents to the

FIGURE 1



LOCATION OF STATIONS

FIGURE 2



RESIDENCE TIME IN NORTHERN REACH, 1961 - 62 WATER YEAR