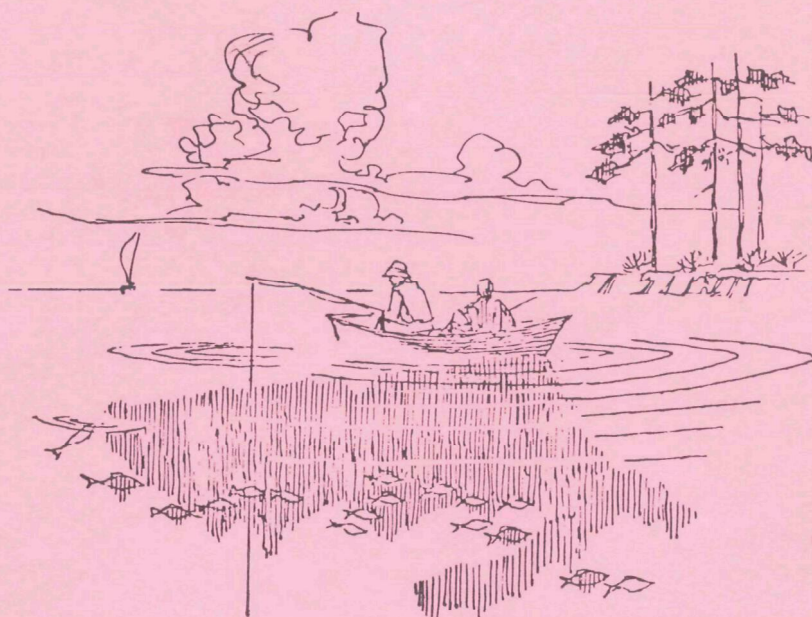




WATER QUALITY STANDARDS CRITERIA DIGEST  
A COMPILATION OF FEDERAL/STATE CRITERIA ON

**-MIXING ZONES-**



ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C.

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## INTRODUCTION

This digest was compiled in order to provide general information to the public as well as to Federal, State, and local officials. It contains excerpts from the individual Federal-State water quality standards establishing criteria for mixing zones for interstate waters. The water quality standards program is directed by the Environmental Protection Agency, an independent regulatory agency which has responsibility for approving State-adopted standards for interstate waters, evaluating adherence to the standards, and overseeing enforcement of standards compliance.

Standards, the first nationwide strategy for water quality management, contain four major elements: the use (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural) to be made of the interstate water; criteria to protect those uses; implementation plans (for needed industrial-municipal waste treatment improvements, among others) and enforcement plans; and an antidegradation statement to protect existing high quality waters.

Minimum water quality criteria, or numerical specifications of physical, chemical, temperature, and biological levels, are stated in the National Technical Advisory Committee report to the Secretary of the Interior, Water Quality Criteria, dated April 1, 1968, and published by the Government Printing Office, Washington, D.C. Unavailability of the NTAC report before June 30, 1967--the date set by the Water Quality Act of 1965 for formal adoption of State standards--resulted in significant variations between the state-adopted and the NTAC minimum criteria. Some standards were adopted and approved before the NTAC report became available. Also, the Water Quality Criteria report is subject to updating in light of new scientific and technical information.

Mixing zones are areas which are unavoidably and harmfully polluted and which are allowed for mixing of the discharged waters with the receiving waters. They have defined and identifiable limits, and the waters outside of the zones must meet the standards for that particular body of water. The Water Quality Criteria report recommends when several mixing zones are located close together that they lie on the same side of the stream to allow a continuous passageway for aquatic organisms on the opposite side. The NTAC report specifies that mixing zones be as small as possible and provided only for mixing in order to preserve the "welfare of the aquatic life resource." This is because mixing zones constitute barriers which can harmfully block the spawning migration of anadromous and catadromous species and damage the plankton organisms and aquatic invertebrates in the water flow. Adequate zones of passage (at least 75% of the cross-sectional stream area, according to NTAC) must be maintained at all times for the fish, and adequate provision must be made for the survival of the drift organisms. Mixing zones cannot be considered a substitute for or an extension of a waste treatment facility. The EPA supports the NTAC recommendations.

Since water quality standards experience revisions and upgrading from time to time, following procedures set forth in the Federal Water Pollution Control Act, individual entries in this digest may be superseded. As these revisions are accomplished, this digest will be updated and reissued. Because this publication is not intended for use other than as a general information resource, for the latest information, and for special purposes and applications, refer to the existing approved water quality standards which can be obtained from the State water pollution control agencies or EPA Washington, D.C. or regional offices.

Individual state-adopted standards follow.

## MIXING ZONES

Alabama	With respect to cooling water discharges only, the ambient temperature of receiving waters shall not be increased by more than 10 degrees Fahrenheit by the discharge of such cooling waters, <u>after reasonable mixing</u> ; nor shall the discharge of such cooling waters, <u>after reasonable mixing</u> , cause the temperature of the receiving waters to exceed 93 degrees Fahrenheit.
Alaska	No reference to mixing zones.
Arizona	No reference to mixing zones.
Arkansas	No reference to mixing zones.
California	No reference to mixing zones.
Colorado	In temperature measurement, allowance shall be made for a mixing zone. Provisions shall be made for adequate mixing and no thermal barrier to migration and free movement of aquatic biota shall be permitted in any waters of the state.
Connecticut	In the discharge of waste treatment plant effluent and cooling waters to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and streams. Such distances required for complete mixing shall not affect the water usage Class adopted but shall be defined and controlled by the Water Resources Commission.
Delaware	The standards proposed are based upon the ability of the Air and Water Resources Commission to measure and to determine compliance. All measurements will be made at selected sites after determining "representativeness" of the sample obtained and the nature of the mixing at the station. Also, short transition zones will exist between adjacent zones of varying water quality.
District of Columbia	Criteria shall apply to an entire stretch of the stream. However, reasonable allowance shall be made for the mixing and dispersion of approved discharges. Sampling frequency shall provide a sound basis for computations.

Within the limits of field conditions, sampling point locations will be selected to permit the collection of representative samples. . . .

No increase in natural water temperature caused by artificial heat inputs shall exceed 5 degrees F. after reasonable allowance for mixing.

Florida

The criteria of water quality hereinafter provided will be applied only after reasonable opportunity for mixture of waste with receiving waters has been afforded; the reasonableness of the opportunity for mixture of waste and receiving water shall be determined on the basis of the physical characteristics of the receiving waters, and the methods in which the discharge is physically made shall be approved by the regulatory agency.

Georgia

Effluents released to streams or impounded waters shall be fully and homogeneously dispersed and mixed insofar as practical with the main flow or water body by appropriate methods at the discharge point. Use of a reasonable and limited mixing zone may be permitted on receipt of satisfactory evidence that such a zone is necessary and that it will not create an objectionable or damaging pollution condition.

Guam

No reference to mixing zones.

Hawaii

Upon the application of any person requesting that a portion of the water areas meeting the basic standards applicable to all waters be zoned for the assimilation of agricultural, municipal and industrial discharges, if the Director of Health shall determine that such uses will not unreasonably interfere with any actual use of the water areas for which it is classified, he shall then designate such portions as a zone of mixing.

The boundaries of each zone of mixing shall be fixed by the Director, taking into account protected uses of the body of water, existing natural conditions of the receiving water (i.e., depth, currents, location, etc.), character of the effluent, and the adequacy of the design of the outfall and diffuser system to achieve a maximum dispersion and assimilation of the treated or controlled waste with a minimum of undesirable or noticeable effect on the receiving water.

The application shall be made on forms furnished by the Director and shall contain the information required therein.

The establishment of a zone of mixing and the boundaries thereof shall be made only after hearing held by the Director on the island where the area is situated in accordance with the Hawaii Administrative Procedure Act

and the Rules of Practice and Procedure of the Department of Health.

The Director, on his own motion, or on the application of any person, shall terminate the designation of a water area as a zone of mixing, if after a hearing, he shall determine that such water area meeting the basic standards applicable to all coastal waters will unreasonably interfere with any actual use of the water area. Such termination shall be made only after a hearing held by the Director on the island where the area is situated in accordance with the Hawaii Administrative Procedure Act and the Rules of Practice and Procedure of the Department of Health. Upon such termination, the standards of water quality applicable thereto shall be those established for the water as otherwise classified.

Idaho

For purposes of enforcement of these standards, sampling will be done at a point where these standards can be evaluated, except for areas immediately adjacent to outfalls. Cognizance will be given to the opportunity for admixture of waste effluents with receiving waters.

Illinois

In the application of any of the rules and regulations in this Chapter, whenever a water quality standard is more restrictive than its corresponding effluent standards then an opportunity shall be allowed for the mixture of an effluent with its receiving waters. Water quality standards must be met at every point outside of the mixing zone. The size of the mixing zone cannot be uniformly prescribed. The governing principle is that the proportion of any body of water or segment thereof within mixing zones must be quite small if the water quality standards are to have any meaning. This principle shall be applied on a case-by-case basis to ensure that neither any individual source nor the aggregate of sources shall cause excessive zones to exceed the standards. The water quality standards must be met in the bulk of the body of water, and no body of water may be used totally as a mixing zone for a single outfall or combination of outfalls. Moreover, except as otherwise provided in this Chapter, no single mixing zone shall exceed the area of a circle with a radius of 600 feet. Single sources of effluents which have more than one outfall shall be limited to a total mixing area no larger than that allowable if a single outfall were used.

In determining the size of the mixing zone for any discharge, the following must be considered:

1. The character of the body of water,
2. the present and anticipated future use of body of water,
3. the present and anticipated water quality of the body of water,
4. the effects of the discharge on the present and anticipated future water quality,
5. the dilution ratio, and
6. the nature of the contaminant.

In addition to the above, for waters designated for aquatic life (General Standards), the mixing zone shall be so designed as to assure a reasonable zone of passage for aquatic life in which the water quality standards are met. The mixing zone shall not intersect any area of any such waters in such a manner that the maintenance of aquatic life in the body of water as a whole would be adversely affected.

Indiana	No reference to mixing zones.
Iowa	Sampling to determine conformance to these criteria shall be done at sufficient distances downstream from waste discharge points to permit adequate mixing. . . .
Kansas	The measurement system to be used in each case should provide for temperature measurement at the outfall and with the maximum temperature allowed at the outfall reflecting a reasonable mixing zone in the receiving waters so that the 5°F or 3°F rise specified is not violated in the contiguous waters. Any barrier to migration and the free movement of aquatic biota is prohibited.
Kentucky	Areas immediately adjacent to outfalls shall be as small as possible, be provided for mixing only, and shall not prevent the free passage of fish and drift organisms.
Louisiana	No reference to mixing zones.
Maine	<p>After adoption of any classification by the legislature for surface waters or tidal flats or sections thereof, it shall be unlawful for any person, corporation, municipality, or other legal entity to dispose of any sewage, industrial or other waste, either alone or in conjunction with another or others, in such manner as will, after due consideration for seasonal, climatic, tidal and natural variations and after reasonable opportunity for dilution, diffusion, mixture or heat transfer to the atmosphere, within mixing zones reasonably established by the Environmental Improvement Commission in the manner provided by this section, lower the quality of said waters, outside such zones, below the minimum requirements of such classification and notwithstanding any licenses which may have been granted or issued under section 413 to 415.</p> <p>The commission may establish a mixing zone with respect to any discharge at the time application for license for such discharge is made pursuant to section 414, and when so established shall be a condition of and form a part of the license issued. The commission may, after 30 days' notice to and a hearing with the affected party, establish by order a mixing zone with respect to any discharge for which a license has heretofore been issued pursuant to section 414, or for which no license is required by virtue of the last sentence of section 413. Prior to the issuance of any order, or commencement of any enforcement action to abate a classification violation, the commission shall establish, in the manner above provided, a mixing zone with respect to the discharge sought to be thereby affected.</p>

In determining the extent of any mixing zone to be by it established under this section, the commission shall solicit and receive testimony concerning the nature and rate of the discharge; the nature and rate of existing discharges to the waterway and their effect upon the ability of the waterway to achieve its classification standards; the size of the waterway and the rate of flow therein; any seasonal, climatic, tidal and natural variation in such size, flow, nature and rate and the effect of such variation upon the ability of the waterway to achieve its classification standards; the uses of the waterways in the vicinity of the discharge, and such other and further evidence as in the commission's judgment will enable it to establish a reasonable mixing zone for such discharge. An order establishing a mixing zone may provide that the extent thereof shall vary in order to take into account seasonal, climatic, tidal and natural variations in the size and flow of, and the nature and rate of discharges to, the waterway.

Where no mixing zones have been established by the commission, it shall be unlawful for any person, corporation, municipality or other legal entity to dispose of any sewage, industrial or other waste, either alone or in conjunction with another or others, into any classified surface waters, tidal flats or sections thereof, in such manner as will, after reasonable opportunity for dilution, diffusion, mixture or heat transfer to the atmosphere, lower the quality of any significant segment of said waters, tidal flats or sections thereof, affected by such discharge, below the minimum requirements of such classification, and notwithstanding any licenses which may have been granted or issued under section 413 to 415.

#### Maryland

For all water use categories other than IV, there must be no temperature change that adversely affects fish, other aquatic life, or spawning success. There must be no thermal barriers to the passage of fish or other aquatic life. Maximum temperature must not exceed 100 degrees F beyond 50 ft. from any point of discharge.

For NONTIDAL WATERS: For the propagation of fish and other aquatic life (Water Use Category IV) in all other nontidal waters, temperature must not exceed 93 degrees F. beyond such distance from any point of discharge as specified by the Department of Water Resources as necessary for the protection of the water use.

For TIDAL WATERS: For the propagation of fish and other aquatic life (Water Use Category IV), temperature must not exceed 90°F. beyond such distance from any point of discharge as specified by the Department as necessary for the protection of the water use.

GENERAL: It is possible that relatively small regions for effluent mixing and assimilation may be permitted to exist without detriment to the water uses of the zone.

Massachusetts	When an effluent is permitted to be discharged to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not affect the water usage class adopted.
Michigan	In areas adjacent to outfalls the standards for the designated water use or uses shall apply after admixture of waste effluents with the public waters but in no instance shall the mixing zone act as a barrier to fish migration or interfere unreasonably with the designated water use or uses for the area. The Water Resources Commission must have discretion in determining the extent of the mixing zone. In general, the Water Resources Commission encourages the use of outfall structures which minimize the extent of the mixing zone.
Minnesota	Reasonable allowance will be made for dilution of the effluents in relation to the uses of the interstate waters into which they are discharged or other interstate waters which may be affected.
Mississippi	Temperature shall not be increased more than ten degrees F. (10°F) above the natural prevailing back-ground temperatures, nor exceed a maximum of 93°F. after reasonable mixing. In cognizance of the fact that certain waters of the state may not fall within desired or prescribed limitations as outlined, the Air & Water Pollution Control Commission may authorize exceptions to these limits upon presentation of good and sufficient evidence of intent to comply to the extent practical or technically feasible.
Missouri	No reference to mixing zones.
Montana	No reference to mixing zones.
Nebraska	No reference to mixing zones.
Nevada	No reference to mixing zones.
New Hampshire	A heated discharge to a lake shall not raise the temperature more than 3 degrees F. at the surface immediately outside a designated mixing zone. New Hampshire had also adopted verbatim the entire criteria pertaining to temperature and zones of passage contained in Section 3 of the National Technical Advisory Committee Report on <u>Water Quality Criteria</u> dated April 1, 1968. This report makes recommendations regarding mixing zones and zones of passage on page 31.

New Jersey

Localized areas of surface waters, as may be designated by the Department of Environmental Protection, into which wastewater effluents, including heat, may be discharged for the purpose of mixing, dispersing or dissipating such wastewater without creating nuisances or hazardous conditions.

Trout Maintenance Streams: No heat may be added which would cause temperatures to exceed 2°F over the natural temperatures at any time or which would cause temperatures in excess of 68°F. Reductions in temperatures may be permitted where it can be shown that trout will benefit without detriment to other designated water uses. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

Non-Trout Waters: No thermal alterations, except in designated mixing zones, which would cause temperatures to deviate more than 5°F at any time from natural stream temperatures or more than 3°F in the epilimnion of lakes and other standing waters. No heat may be added, except in designated mixing zones, which would cause temperatures to exceed 82°F for smallmouth bass or yellow perch waters or 86°F for other non-trout waters. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

New Mexico

Samples taken for the regulation and enforcement of these standards are to be collected at the mid-point of the stream flow at locations a sufficient distance downstream from the point of introduction of waste-water inflow to provide for reasonable mixing of the stream and the inflowing water. Sampling in reservoirs and lakes for the purposes of the general standards may be at any point in the body of the water, but not closer than 250 feet from the point of introduction of a water contaminant. A reservoir or lake is considered to include all of the area flooded when the water in the basin is at the spill-way level.

New York

Trout Maintenance Streams: No heat may be added which would cause temperature to exceed 2°F over the natural temperatures at any time or which would cause temperatures in excess of 68°F. Reductions in temperatures may be permitted where it can be shown that trout will benefit without detriment to other designated water uses. The rate of temperature change in designated mixing zones shall not cause mortality of the biota.

Non-Trout Waters: (1) Mixing Zone: The mixing zone will be separately determined for each discharge so as to minimize detrimental effects. Fish and other aquatic life shall be protected from thermal blocks by providing for a minimum fifty percent stream or estuarine cross-section and/or volumetric passageway, or establishing artificial fishways where considered necessary. Generally, the surface water temperature shall not exceed 90°F within the mixing zone. Consideration will be given to effects of each discharge based on hydrodynamics and

other factors of receiving waters. (2) Outside Mixing Zone: Stream temperature in excess of 80°F will not be permitted after mixing. Further, no permanent change in excess of 5°F will be permitted from naturally occurring background temperatures. In multiple discharge situations stream capacity to meet such criteria will be apportioned among the discharges. (3) Outside Mixing Zone: Fresh Surface Water Classes: Temperature change rate shall be limited to 2°F per hour, not to exceed 9°F in any 24-hour period, further limited in that for any seven day period the average change will meet the 5°F change of background criteria stated in item 2 above. (4) Outside Mixing Zone: Tidal Salt Water Classes: Discharges shall not raise monthly means of maximum daily temperatures more than 4°F from September through May, nor more than 1.5°F during June, July, and August. Temperature change shall not be more than 1°F per hour, not to exceed 7°F in any 24-hour period at maximum, except when natural phenomena cause these limits to be exceeded.

#### North Carolina

In making tests for analytical determinations of classified waters to determine conformity or non-conformity with the established standards, samples shall be collected outside the limits of prescribed mixing zones in such manner and at such times and locations as to be representative of the receiving waters after reasonable opportunity for dilution and mixture with the waste discharged thereto. The limits of mixing zones will be defined by the Department of Water and Air Resources on a case by case basis after consideration of the magnitude and character of the waste discharged and the size and character of the receiving waters. Such zones shall be restricted to as small an area and length as possible, and shall not prevent free passage of fish or cause fish mortality.

#### North Dakota

The distance of river flow to allow for a reasonable opportunity to mix and dilute wastes shall be at the discretion of the State Department of Health and will be based upon stream flow conditions at the time of sampling, except where such discharges may adversely affect a beneficial water use immediately downstream or in close proximity to the waste point. In such instances, a change in the method of waste discharge or other control measures may be required.

#### Ohio

For areas designated for aquatic life or recreation uses cognizance will be given to opportunity for the admixture of effluents with stream water.

#### Oklahoma

All tributary streams and all waste effluents shall be in such condition that when discharged to the streams reaches as defined, and interstate tributaries, they shall not create conditions which will adversely affect public health, or use of the water for beneficial purposes.

Oregon	No reference to mixing zones.
Pennsylvania	No reference to mixing zones.
Puerto Rico	No reference to mixing zones.
Rhode Island	In the discharge of waste treatment plant effluents to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not affect the water usage Class adopted but shall be defined and controlled by the regulatory authority.
South Carolina	<p>Lakes and Reservoirs: The size of the mixing zone will be determined on an individual project basis and will be based on normal engineering considerations, and the area affected shall be kept at a minimum. The mixing zone shall not prevent free passage of fish or cause fish casualty.</p> <p>Streams: That the zone of mixing shall be limited to not more than 25 percent of the cross-sectional area and/or volume of the flow of the stream and shall not include more than one-third of the surface area measured from shore to shore.</p>
South Dakota	In making tests or analytical determinations of surface waters to determine conformity or non-conformity with the established criteria, samples shall be collected in such manner and at such locations, times and frequencies as approved by the Committee on Water Pollution. Every effort should be made to make the samples representative of the receiving waters after reasonable opportunity for dilution and mixture with the polluting material discharged thereto.
Tennessee	Mixing zone refers to that section of flowing stream or impounded waters necessary for effluents to become dispersed. The mixing zone necessary to each particular case shall be defined by the Tennessee Stream Pollution Control Board.
Texas	Sampling will be in accordance with fully recognized procedures. Samples must be representative of the receiving waters allowing time and distance for mixing.
Utah	No reference to mixing zones.
Vermont	In assigning classifications to the waters of the State the Department of Water Resources may designate certain lengths or areas of such waters as mixing zones provided that any such mixing zones shall be only for the dispersal and dilution of wastes which have been treated in a manner approved by the department, shall be of no greater length or area than is required for such purposes and may only be allowed if such wastes conform substantially with the technical and other requirements established for the receiving waters. Such a mixing zone shall not constitute

a barrier to the passage or migration of fish or produce adverse effects on any fishery or other forms of wild or aquatic life." The state interprets this to mean that they will not authorize any mixing zone which will reduce the passageway to less than 75% of the cross sectional area or volume of flow of the stream.

Virgin Islands

For waters classified for use as harbors and docking facilities the following criteria are applicable at any point in the harbor except for areas immediately adjacent to outfalls or drainage ditches. In such areas recognition will be given to opportunities for the admixture of waste effluents with harbor waters.

Virginia

There shall be no sudden temperature changes that may affect aquatic life. There shall be no thermal barriers to the passage of fish. Essential spawning areas shall not be affected.

Washington

No reference to mixing zones.

West Virginia

No reference to mixing zones.

Wisconsin

The Department of Resources Development may require management of waste admixture zones depending on such factors as effluent quality and quantity, available dilution, temperature, current, and restrictions to the movement of fish.

Wyoming

Bacteriological standards which protect water supply and full body contact will be determined at water supply intakes and designated full body contact recreation areas. In regard to water quality parameters it shall be the goal to promote facilities which will, in time, allow these standards to be applied in the zone of mixing, i.e., diffusion or rapid mixing.