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United States  
Environmental Protection  
Agency

Office of Water  
Regulations and Standards  
Washington, D.C. 20460

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Water



# Temperature

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## Water Quality Standards Criteria Digest A Compilation of State/Federal Criteria





TEMPERATURE

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Criteria Digest  
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## INTRODUCTION

This digest is compiled 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 pollutant specific criteria for interstate surface waters. The water quality standards program is implemented by the U.S. Environmental Protection Agency where responsibility for providing water quality recommendations, approving State-adopted standards for interstate waters, evaluating adherence to the standards, and overseeing enforcement of standards compliance, has been mandated by Congress.

Standards, a nationwide strategy for surface water quality management, contain three major elements: the use (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural) to be made of the navigable water; criteria to protect these uses; and an antidegradation statement to protect existing high quality waters, from degradation by the addition of pollutants.

Water quality criteria (numerical or narrative specifications) for physical, chemical, temperature, and biological constituents are stated in the July 1976 U.S. Environmental Protection Agency publication Quality Criteria for Water (QCW), available from the Government Printing Office, Washington, D.C. The 1976 QCW, commonly referred to as the "Red Book," is the most current compilation of scientific information used by the Agency as a basis for assessing water quality. This publication is subject to periodic updating and revisions in light of new scientific and technical information.

Temperature standards, which are the subject of this digest, are set to control thermal pollution, or the amount of heated wastes discharged into a water body. Thermal pollution creates adverse conditions which can inhibit a balanced aquatic ecosystem by accelerating the activity of aquatic plants, oxygen solubility and depleting mechanisms, and taste and odor.

Quality Criteria for Water, used by EPA in evaluating State temperature standards, recommends:

#### Freshwater Aquatic Life

For any time of year, there are two upper limiting temperatures for a location (based on the important sensitive species found there at that time):

1. One limit consists of a maximum temperature for short exposures that is time dependent and is given by the species-specific equation:

$$\text{Temperature}(\text{°C}) = 1b[\log_{10}(\text{time in minutes}) - a] - 2 \text{ Where:}$$

a=intercept on the "y" or logarithmic axis of the line fitted to experimental data which are available for some species from Appendix II-C, NAS, 1974.

b=slope of the line fitted to experimental data which are available for some species from Appendix II-C, NAS, L(&\$.

2. The second value is a limit on the weekly average temperature that:

- a. in the cooler months (mid-October to mid-April in the north and December to February in the South) will protect against mortality of important species if the elevated plume temperature is suddenly dropped to the ambient temperature, with the limit being the acclimation temperature minus 2°C when the lower lethal threshold temperature equals the ambient water temperature (in some regions this limitation may also be applicable in summer); or
- b. in the warmer months (April through October in the north and March through November in the south) is determined by adding to the physiological optimum temperature (usually for growth) a factor calculated as one-third of the difference between the ultimate upper incipient lethal temperature and the optimum temperature for the most sensitive important species (and appropriate life state) that normally is found at that location and time; or
- c. during reproductive seasons (generally April through June and September through October in the North and March through May and October through November in the south) meets site-specific requirements for successful migration, spawning, egg incubation, fry rearing, and other reproductive functions of important species. These local requirements should supercede all other

requirements when they are applicable; or

- d. is a site-specific limit that is found necessary to preserve normal species diversity or prevent appearance of nuisance organisms.

#### Marine Aquatic Life

In order to assure protection of the characteristic indigenous marine community of a water body segment from adverse thermal effects:

1. the maximum acceptable increase in the weekly average temperature due to artificial sources is  $1^{\circ}\text{C}(1.8^{\circ}\text{F})$  during all seasons of the year, providing the summer maxima are not exceeded; and
2. daily temperature cycles characteristic of the water body segment should not be altered in either amplitude or frequency.

Summer thermal maxima, which define the upper thermal limits for the communities of the discharge area, should be established on a site-specific basis. Existing studies suggest the regional limits expressed in Table 18.

Table 18

	Short term maximum	Maximum true day mean *
Sub-tropical Regions (south of Cape Canaveral and Tampa Bay, Fla., and Hawaii)	32.2°C (90°F)	29.4°C (85°F)
Cape Hatteras, N.C., to Cape Canaveral, Fla.	32.2°C (90°F)	29.4°C (85°F)
Long Island (south shore) to Cape Hatteras, N.C.	30.6°C (87°F)	27.8°C (82°F)

\*True daily mean = average of 24 hourly temperature readings.

Baseline thermal conditions should be measured at a site where there is no unnatural thermal addition from any source, which is in reasonable proximity to the thermal discharge (within 5 miles) and which has similar hydrography to that of the receiving waters at the discharge.

Since water quality standards experience revisions and upgrading from time to time, following procedures set forth in the Clean Water Act, individual entities in this digest may be superseded. As these revisions are accomplished and allowing for the States to revise



their standards accordingly, this digest will be updated and reissued. Because this publication is not intended for use other than as a general information resource, to obtain the latest information and special purposes and applications, the reader needs to refer to the current approved water quality standards. These can be obtained from the State water pollution control agencies or the EPA Regional Offices.

Individual State-adopted criteria follow:

Alabama:

PWS - a. The maximum temperature in streams, lakes and reservoirs other than those in river basins listed in Part b. hereof shall not exceed 90°F.

b. The maximum temperatures in streams, lakes and reservoirs in the Tennessee and Cahaba River Basins and for that portion of the Tallapoosa River Basin from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers which has been designated by the Alabama Department of Conservation and Natural Resources as supporting smallmouth bass, sauger, and walleye shall not exceed 86°F.

c. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 5°F in streams, lakes and reservoirs in non-coastal and non-estuarine areas.

d. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 4°F in coastal or estuarine waters during the period October through May nor shall the rise exceed 1.5°F during the period June through September.

e. In lakes and reservoirs there shall be no withdrawals from nor discharge of heated waters to the hypolimnion unless it can be shown that such discharge will be beneficial to water quality.

f. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained, and there shall be no thermal block to the migration of aquatic organisms.

g. Thermal permit limitations in State discharge permits may be less stringent than those required by criteria a. - d. hereof when a showing by the discharger has been made pursuant to Section 316 of P.L. 92-500 or pursuant to a study of an equal or more stringent nature required by the State of Alabama authorized by Table 22, Section 22-2-9(c), Code of Alabama, 1975, that such limitations will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, in and on the body of water to which the discharge is made. Any such demonstration shall take

Alabama (Cont'd)

into account the interaction of the thermal discharge component with other pollutants discharged.

Rec. - Same as PWS.

Agri. & Ind. - The maximum temperature rise above natural temperatures before the addition of artificial heat shall not exceed 5°F in streams, lakes, and reservoirs nor shall the maximum water temperature exceed 90°F.

Shell. - Same as PWS.

Ind. Oper. - Same as Agri. & Ind.

F&WL - Same as PWS.

Navigation - Same as Agri. & Ind.

Alaska

FRESH

Water Supply:

- Drinking/Food Processing - Shall not exceed 15°C.
- Agriculture - Shall not exceed 30°C.
- Aquaculture - Shall not exceed 20°C at any time. The following maximum temperatures shall not be exceeded where applicable:

Migration Routes - 15°C  
Spawning Routes - 13°C  
Rearing Areas - 15°C  
Egg and Fry Incubation - 13°C  
For all other waters, the weekly average temperature shall not exceed site specific requirements needed to preserve normal species diversity or to prevent appearance of nuisance organisms.

Industrial - Shall not exceed 25°C.

Water Recreation:

- Primary Contact - Shall not exceed 30°C.
- Secondary Contact - Not applicable.

Growth and Propagation of Fish, Shellfish, other Aquatic Life, and Wildlife including Water fowl and Shall not exceed 20°C at any time. The following maximum temperatures shall not be exceeded where applicable:

Furbearers:

Migration Routes - 15°C.  
 Spawning Routes - 13°C.  
 Rearing Areas - 15°C.  
 Egg and Fry Incubation - 13°C.  
 For all other waters, the weekly average temperature shall not exceed site specific requirements needed to preserve normal species diversity or to prevent appearance of nuisance organisms.

MARINE

Water Supply:  
 Aquaculture

- Shall not cause the weekly average temperature to increase more than 1°C. The maximum rate of change shall not exceed 0.5°C per hour. Normal daily temperature cycles shall not be altered in amplitude or frequency.

Seafood Processing - Shall not exceed 15°C.

Industrial - Shall not exceed 25°C.

Water Recreation:

Primary Contact - Not applicable.  
 Secondary Contact - Not applicable.

Growth and Propagation of Fish, Shellfish, other Aquatic Life, and Wildlife, including Seabirds, Waterfowl and Furbearers:

- Shall not cause the weekly average temperature to increase more than 1°C. The maximum rate of change shall not exceed 0.5°C per hour. Normal daily temperature cycles shall not be altered in amplitude or frequency.

Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life:

- Shall not cause the weekly average temperature to increase more than 1°C. The maximum rate of change shall not exceed 0.5°C per hour. Normal daily temperature cycles shall not be altered in amplitude or frequency.

Arizona: 93° max; not more than 5°F change.

Cold water fish. - November - March--55°F max. - not more than 2°F change, April - October--70°F max. - not more than 2°F change.

Arkansas: Temperature - During any month of the year, heat shall not be added to any stream in excess of the amount that will elevate the temperature of the water more than 5°F, based upon the monthly average of the maximum daily temperatures as measured at mid-depth or 5 feet, whichever is less. In lakes and resevoirs, the temperature shall not be raised more than 3°F above that which existed before the addition of heat of artificial origin, based upon the avarrage of temperatures taken from surface to bottom, or from surface to thermocline, if present. The maximum temperature due to man-made causes shall not exceed 68°F in trout waters, 86°F in smallmouth bass waters, or 90°F in all other waters except for the following:

1. Red River - 93°F.
2. Kelley Bayou - 91°F.
3. Bayou Dorcheat - 91°F.
4. Ouachita River (State line to Rammel Dam) - 91°F.
5. Lake Catherine - 93°F.
6. Bayou Macon - 91°F.
7. Arkansas River - 93°F.
8. Dardanelle Reservoir (Segment 3E) - 95°F with 5°F maximum increase.
9. White River (Mouth to Lock & Dan #1) - 93°F.
10. Spring River (Mouth to mouth of South Fork) - 93°F.
11. Little Missouri River (Mouth to mouth of Muddy Fork) - 93°F.
12. McKinney Bayou - 93°F.

The temperature requirements shall not apply to offstream or privately-owned reservoirs constructed primarily for industrial cooling purposes and financed in whole or in part by the entity using the lake for cooling purposes.

California: (The following is condensed from the "California Thermal Water Quality Control Plan for Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries.")

The standards establish a complex set of thermal requirements. For many categories of receiving waters, requirements differ between "thermal waste" (herein "TW," defined as water used for transporting waste heat) and "elevated temperature waste" (herein "ETW," defined as any discharge, including thermal waste but excluding irrigation return water, which exceeds the natural temperature of the receiving water.

1. Cold interstate waters. ETW's are prohibited.

2. Warm interstate waters.

- A. TW's with temperature greater than 5°F above receiving water temperature are prohibited.
- B. ETW's shall not raise receiving water temperature by more than 5°.
- C. Colorado River. Maximum rise 5°F in river, 3°F in Lake Havasu. Maximum temperatures:

Jan	60°	Jul	90°
Feb	65	Aug	90
Mar	70	Sept	90
Apr	75	Oct	82
May	82	Nov	72
June	86	Dec	65

- D. Lost River. Maximum rise 2° up to 62° maximum temperature.

3. Coastal waters.

- A. Existing discharges.

- (1) ETW's must comply with limitations necessary to protect beneficial uses.

- B. New discharges.

- (1) ETW's must be to open ocean away from the shoreline, dispersion through the vertical water column.

- (2) ETW's away from areas of special biological significance.

- (3) TW's must have a maximum temperature not exceeding water temperature by more than 20°.

- (4) ETW's must not increase water temperature more than 4° at (a) shoreline, (b) surfaced beyond 1,000 feet from the discharge system. Surface limits must be maintained at least 50% of the tidal cycle. Alternate objectives may be specified if they assure full protection of the aquatic environment. (May be

specified only with State Board and EPA concurrence.)

- (5) Additional limitations may be imposed when necessary to protect the aquatic environment.

4. Enclosed bays.

A. Existing discharges.

- (1) ETW's must comply with limitations necessary to protect beneficial uses.

B. New discharges.

- (1) ETW's must comply with limitations necessary to protect beneficial uses. Maximum discharge temperature must not exceed receiving water temperature by more than 20°.
- (2) TW's with temperature greater than 4° above receiving water temperature are prohibited.

5. Estuaries.

A. Existing discharges.

(1) ETW's:

[a.] Temperature shall not exceed receiving water temperature by more than 20°.

[b.] Must not, individually or combined, create zone (receiving water temperatures more than 1° above natural) which exceeds 25% of cross-sectional area of main channel;

[c.] No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.

[d.] Additional limits necessary to protect beneficial uses.

- (2) TW's must comply with 5A(1) and their maximum temperature must not exceed 86°.

B. New discharges.

- (1) ETW's must comply with 5A(1).
- (2) TW's with temperature greater than 4° above receiving water temperature are prohibited.
- (3) Additional limits necessary to protect beneficial uses.

General Provisions. Standards also contain general provisions which include the following:

1. Authorization for additional individual limitations to confine heat dispersion to a 1 1/2° isotherm in a minimal, defined area;
2. Prohibition of cumulative heat effects in excess of the standards;
3. A requirement that the State Board designate biologically significant areas for special protection.
4. Authorization to make exceptions if:
  - A. The heat discharge will be beneficial;
  - B. Intermittent heat is the least harmful method of control fouling organisms in intake and discharge structures;
  - C. Compliance would cause a greater environmental impact than modification of the standards, or
  - D. Compliance by existing discharges would not be commensurate with the benefit to the aquatic environment.

NOTE: Exceptions will be made only with EPA concurrence.

In addition, the following temperature objectives apply to intrastate surface waters:



California (Cont'd)

- ° The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- ° At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.
- ° At no time or place shall the temperature of WARM intrawaters be increased more than 5°F above natural receiving water temperature.

Colorado:

- A<sub>1</sub> Temperature maintains a normal pattern of diurnal and seasonal fluctuations and does not change abruptly. No warming discharge is permitted in the hypolimnion of lakes. Temperature is not increased above 68°F. by any means other than natural means, or is temperature increased in streams and in the epilimnion of lakes or reservoirs more than 2°F. by any discharge.
- A<sub>2</sub> Temperature maintains a normal pattern of diurnal and seasonal fluctuations and does not change abruptly. No warming discharge is permitted in the hypolimnion of lakes or reservoirs. Temperature is not increased above 90°F. by any means other than natural means, or is temperature increased by discharges in streams more than 5°F., and in the epilimnion of lakes or reservoirs more than 3°F.
- B<sub>1</sub> Temperature maintains a normal pattern of diurnal and seasonal fluctuations and does not change abruptly. No warming discharge is permitted in the hypolimnion of lakes. Temperature is not increased above 68°F. by any means other than natural means, nor is temperature increased in streams and in the epilimnion of lakes or reservoirs more than 2°F. by any discharge.
- B<sub>2</sub> Temperature maintains a normal pattern of diurnal and seasonal fluctuations and does not change abruptly. No warming discharge is permitted in the hypolimnion of lakes or reservoirs. Temperature is not increased above 90°F. by any means other than natural means, or is temperature increased by discharges more than 5°F. in streams and more than 3°F. in the epilimnion of lakes or reservoirs.

Connecticut:

Class A and AA (PWS) - No increase other than natural origin.

Class B (Rec.) - No increase to exceed recommended  
Class C (F&WL) limits on most sensitive water use,  
and in no case to exceed 4°F over  
natural with a max. of 85°F.

Class SA (Shell.) - No increase to exceed recommended  
Class SB limits on most sensitive water  
(Restricted Shell.) use, and in no case to exceed  
Class SC (Shell 83°F or raise normal temp of  
receiving water more than 4°F.  
During July, Aug., Sept. normal  
temp of receiving water shall not  
be raised more than 1.5°F.

Delaware:

General Criteria for all non-tidal portions of stream basins  
(segments).

Any artificially induced rise shall not exceed 5°F  
above the seasonal normal temperature or 85°F,  
(29°C), whichever is less.

Specific criteria for all tidal portions of basins  
except Delaware River and Chesapeake and Delaware  
Canal, but including the Atlantic Ocean and Delaware  
Bay below RM 48.2 in addition to general criteria in  
9A. Any repeated indicator/criteria found here  
supersedes that of 9A.

Coastal and Estuarine waters: No heat may be added  
except in designated mixing zones which would cause  
temperatures to exceed 85°F, or which would cause the  
temperatures to be raised by more than 4°F during  
September through May, or to be raised by more than  
1.5°F during June through August. The rate of tem-  
perature change in designated mixing zones shall not  
cause mortality of fish, shellfish, or their eggs.

Specific criteria for Delaware River (from PA. - DE.  
Line, RM 78.8 to Liston Point RM 48.2) in addition to  
the general criteria of 9A. Repeated indicator/  
criteria here supersedes that of 9A.

No heat may be added except in designated mixing  
zones which would cause temperature to exceed 86°F or  
which would cause the temperature to be raised more  
than 1.5°F during June through August. The rate of  
temperature change in designated mixing zones shall  
not cause mortality of fish or shellfish.

District of Columbia:

Not to exceed 90°F, 5°F change limit; no sudden or  
localized temperature changes which may adversely  
affect aquatic life.

Florida:

(3) All discharges or proposed discharges of heated water into receiving bodies of water (RBW) which are controlled by the state shall be subjected to a thorough study to assess the consequences of the discharge upon the environment. The state shall be divided into two general climatological zones: Peninsular Florida, which varies from tropical in nature to temperate but is modified by the peninsular configuration and is the area south of latitude 30°N (excluding Gulf and Franklin Counties); and Northern Florida which is temperate and continental and is the area above latitude 30°N plus the portions of Gulf and Franklin Counties which lie below 30°N.

(a) Heated water discharges existing on July 1, 1972:

(i) Shall not increase the temperature of the RBW so as to cause damage or harm to the aquatic life or vegetation therein or interfere with beneficial uses assigned to the RBW.

(ii) Shall be monitored by the discharger to ensure compliance with this rule, and

(iii) Shall be converted to offstream cooling or approved alternative methods in the event such monitoring produces evidence of substantial damage.

(b) Heated water sources proposed for future discharges into RBW controlled by the state shall not increase the water temperature by more than the monthly temperature limits prescribed for the particular type and location of the RBW. New sources shall include all expansions, modifications, alterations, replacements or repairs which result in an increase output of ten percent (10%) or more of the level of energy production which existed on the date this rule became effective. Water temperatures shall be measured by procedures approved by the Florida Department of Pollution Control (DPC). In all cases where a temperature rise above ambient is allowed and a maximum RBW temperature is also prescribed, the lower of the two limitations shall be the control temperature.

(c) Definitions.

(i) Ambient (natural) temperature of a RBW is the existing temperature of the receiving water at a location which is unaffected by manmade thermal discharges and a location which is also of a depth and exposure to winds and currents which typify the most environmentally stable portions of the RBW.

Florida (Cont'd):

(ii) Coastal waters shall be all waters in the state which are not classified as fresh waters or as open waters.

(iii) A cooling pond is a body of water enclosed by natural or constructed restraints which has been approved by the Florida DPC for purposes of controlling heat dissipation from thermal discharges.

(iv) An existing heat source is any thermal discharge (a) which is presently taking place, or (b) which is under construction or for which a construction or operating permit has been issued prior to the effective date of this rule.

(v) Fresh waters shall be all waters of the state which are contained in lakes and ponds, or are in flowing streams above the zone in which tidal actions influence the salinity of the water and where the concentration of chloride ions is normally less than 1500 mg/l.

(vi) Open waters shall be all waters in the state extending seaward from the most seaward 18-foot depth contour line (three-fathom bottom depth contour) which is offshore from any island; exposed or submerged bar or reef; or mouth of any embayment or estuary which is narrowed by headlands. Contour lines shall be determined from Coast or Geodetic Survey Charts.

(vii) The point of discharge (POD) for a heated water discharge shall be primarily that point at which the effluent physically leaves its carrying conduit (open or closed), and discharges into the waters of the state, or in the event it is not practicable to measure temperature at the end of the discharge conduit, a specific point designated by the Florida Department of Pollution Control for that particular thermal discharge.

(viii) Heated water discharges are the effluents from commercial or industrial activities or processes in which water is used for the purpose of transporting waste heat, and which constitute heat sources of one million British Thermal Units per hour (1,000,000 BTU/HR.), or greater.

(d) Monthly and Maximum Temperature Limits

(i) Fresh Waters - Heated water with a temperature at the POD more the 5°F higher than the ambient (natural) temperature of any stream shall not be discharged into such stream. At all times under all conditions of stream flow the discharge temperature shall be controlled so that at least two-thirds (2/3) of the width of the stream's surface remains at

ambient (natural) temperature. Further, no more than one-fourth (1/4) of the cross-section of the stream at a traverse perpendicular to the flow shall be heated by the discharge. Heated water with a temperature at the POD more than 3°F higher than the ambient (natural) temperature of any lake or reservoir shall not be discharged into such lake or reservoir. Further no heated water with a temperature above 90°F shall be discharged into any fresh waters in Northern Florida regardless of the ambient temperature of the RBW. In Peninsula Florida, heated waters above 92°F shall not be discharged into fresh waters.

(ii) Coastal Waters - Heated water with a temperature at the POD more than 2°F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone during the months of June, July, August, and September. During the remainder of the year, heated water with a temperature at the POD more than 4°F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone. In addition, during June, July, August, and September, no heated water with a temperature above 92°F shall be discharged into coastal waters during the period October thru May.

(iii) Open Waters - Heated water with a temperature at POD up to 17°F above ambient (natural) temperature of the RBW may be discharged from an open or closed conduit into open waters under the following restraints: The surface temperature of the RBW shall not be raised to more than 97°F and the POD must be sufficient distance offshore to ensure that the adjacent coastal waters are not heated beyond the temperatures permitted in such waters.

(iv) Cooling Ponds - The temperature for heated water discharged from a cooling pond shall be measured at the POD from the pond, and the temperature limitation shall be that specified for the RBW.

(e) General.

(i) Daily seasonal temperature variations that were normal to the RBW before the addition of heat from other than natural causes shall be maintained.

(ii) Recapitulation of temperature limitations prescribed above:

ZONE	STREAMS	LAKES	COASTAL		OPEN
			SUMMER	REMAINDER	
NORTH.	90°F Max. AM. +5°F	90°F Max. AM. +3°F	92°F Max. AM. +2°F	90°F Max. AM. +4°F	97°F Max. AM. +15°F
PENIN.	92°F Max. AM. +5°F	92°F Max. AM. +3°F	92°F Max. AM. +2°F	90°F Max. AM. +4°F	97°F Max. AM. +17°F

Georgia:

PWS - Not to exceed 90.0° at any time and not to be Rec. - increased more than 5°F above intake  
F&WL - temperature. In streams designated by the Shell.-State Fish and Game as trout or Smallmouth Bass waters, there shall be no elevation or depression of natural stream temperature, except that secondary (put & take) Trout waters can be elevated 2°F maximum above natural stream temperature.

In estuarine waters, the increase will not be more than 1.5°F.

Guam:

PWS - 85°F max., 5°F change limit, 1.5°F hourly change limit.  
Rec. - 85°F.

F&WL - 1.5°F change limit from natural conditions.

Hawaii:

Classes AA, A, B, 1 and 2 (all uses of coastal and tidal waters) - Temperature of receiving waters shall not change more than 1.5°F from natural conditions.

Idaho:

Warm Water Biota - Water temperatures of 33°C or less with a maximum daily average not greater than 29°C.

Cold Water Biota - Water temperatures of 22°C or less with a maximum daily average of no greater than 19°C.

Salmonid Spawning - Water temperatures of 13°C or less with a maximum daily average no greater than 9°C.

The wastewater must not affect the receiving water outside the mixing zone so that:

- (1) The temperature of the receiving water or of downstream waters will interfere with designated uses.
- (2) Daily and seasonal temperature cycles characteristic of the water body are not maintained.
- (3) If the water is designated for warm water biota, the induced variation is more than +2°C.

Idaho (Cont'd)

- (4) If the water is designated for cold water biota or salmonid spawning, the induced variation is more than  $+1^{\circ}\text{C}$ .

Illinois:

Temperature [STORET number (f°) 00011 and (C°) 00010]:

- (1) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
- (2) The normal daily and seasonal temperature fluctuations that existed before addition of heat due to other than natural causes shall be maintained.
- (3) The maximum temperature rise above natural temperatures shall not exceed  $5^{\circ}\text{F}$ .
- (4) In addition, the water temperature at representative locations in the main river shall not exceed the maximum limits in the following table during more than one percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the following table by more than  $3^{\circ}\text{F}$ .

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
Mississippi River (Wisc. Border to Iowa Border) (°F)	45°	45°	57°	68°	78°	85°	86°	86°	85°	75°	65°	52°
Mississippi River (Iowa Border to Alton Lock and Dam) (°F)	45°	45°	57°	68°	78°	86°	88°	88°	86°	75°	65°	52°
Mississippi River (South of Alton Lock and Dam) (°F)	50°	50°	60°	70°	80°	87°	89°	89°	87°	78°	70°	57°
Ohio River (°F)	50°	50°	60°	70°	80°	87°	89°	89°	87°	78°	70°	57°
Wabash River & Its Interstate Tributaries (°F)	50°	50°	60°	70°	80°	90°	90°	90°	90°	78°	70°	57°
Other Waters (°F)	60°	60°	60°	90°	90°	90°	90°	90°	90°	90°	90°	60°

Main River temperatures are temperatures of those portions of the river essentially similar to and following the same thermal regime as the temperatures of the main flow of the river.

- (5) The owner or operator of source of heated effluent which discharges 0.5 billion British thermal units per hour or more shall demonstrate in a hearing before this Board not less than 5 nor more than 6 years after the effective date of these regulations or, in the case of new sources, after the commencement of operation, that discharges from that source have not caused and cannot be reasonably expected to cause significant ecological damage to the receiving waters. If such proof is not made to the satisfaction of the Board appropriate corrective measures shall be ordered to be taken within a reasonable time as determined by the Board.



have not caused and cannot be reasonably expected to cause significant ecological damage to the receiving waters. If such proof is not made to the satisfaction of the Board appropriate corrective measures shall be ordered to be taken within a reasonable time as determined by the Board.

- (6) Permits for heated effluent discharges, whether issued by the Board or the Environmental Protection Agency, shall be subject to revision in the event that reasonable future development creates a need for reallocation of the assimilative capacity of the receiving stream as defined in the regulation above.
- (7) The owner or operator of a source of heated effluent shall maintain such records and conduct such studies of the effluents from such source and of their effects as may be required by the Environmental Protection Agency or in any permit granted under the Environmental Protection Act.
- (8) Appropriate corrective measures will be required if, upon complaint filed in accordance with Board rules, it is found at any time that any heated effluent causes significant ecological damage to the receiving stream.
- (9) Deleted.
- (10) All effluents to an artificial cooling lake must comply with the applicable provisions of the thermal water quality standards set forth in Rule 203(i), except when all of the following requirements are met:
  - (aa) All discharges from artificial cooling lake to other waters of the State comply with the applicable provisions of Rule 203(i)(1-4).
  - (bb) The heated effluent discharged to the artificial cooling lake complies with all other applicable provisions of this Chapter, except Rule 203(i)(1-4).
  - (cc) At an adjudicative hearing, the discharger shall satisfactorily demonstrate to the Board that the artificial cooling lake receiving the heated effluent will be environmentally acceptable, and within the intent of the Act, including, but not limited to:
    - (1) provision of conditions capable of supporting shellfish, fish, and wildlife, and recrea-

tional uses consistent with good management practices, and

- (2) control of the thermal component of the discharger's effluent by a technologically feasible and economically reasonable method.
  - (dd) The required showing in Rule 203(i)(10)(cc) may take the form of an acceptable final environmental impact statement or pertinent provisions of environmental assessments used in the preparation of the final environmental impact statement, or may take the form of a showing pursuant to §316(a) of the FWPCA, which addresses the requirements of Rule 203(i)(10)(cc).
  - (ee) If an adequate showing as provided in Rule 203(i)(10)(cc) is found, the Board shall promulgate specific thermal standards to be applied to the discharge to that artificial cooling lake.
- (11) Exceptions to Rule 203(i):
- (aa) Lake Clinton:  
The thermal discharge to Lake Clinton shall meet the following standards and conditions:
    - (1) The effluent temperature shall not exceed 96°F.
    - (2) All conditions adopted by Board Order in PCB 75-31 (July 31, 1975).
  - (bb) Lake Sangchris:  
The thermal discharge to Lake Sangchris shall meet the following standards and conditions:
    - (1) The effluent temperature shall not exceed 99°F during more than seven (7) percent of the hours in the 12-month period ending with any month and shall at no time exceed 111°F.
  - (cc) Lake Michigan:

Temperature (STORET numbers - (°F) 00011 and (°C) 00010):

- (1) (A) All sources of heated effluents in existence as of January 1, 1971 shall meet the following restrictions outside of a mixing zone which shall be no greater than a circle with a radius of 1,000 feet or an equal fixed area of simple form.

- (i) There shall be no abnormal temperature changes that may affect aquatic life.
- (ii) The normal daily and seasonal temperature fluctuations that existed before the addition of heat shall be maintained.
- (iii) The maximum temperature rise at any time above natural temperatures shall not exceed 3°F. In addition, the water temperature shall not exceed the maximum limits (°F) indicated in the following table:

JAN.	45	JUL.	80
FEB.	45	AUG.	80
MAR.	45	SEPT.	80
APR.	55	OCT.	65
MAY	60	NOV.	60
JUNE	70	DEC.	50

- (B) The owner or operator of a source of heated effluent which discharges 0.5 billion British Thermal Units per hour (BTU/HR.) or more shall demonstrate in a hearing before this Board not less than five nor more than six years after the adoption of this regulation, that discharges from that source have not caused and cannot be reasonably expected in the future to cause significant ecological damage to the Lake. If such proof is not made to the satisfaction of the Board, backfitting of alternative cooling devices shall be accomplished within a reasonable time as determined by the Board.
- (C) The owner or operator of a source of heated effluent shall maintain such records and conduct such studies of the effluents from such source and of their effects as may be required by the Environmental Protection Agency or in any permit granted under the Environmental Protection Act.
- (D) Backfitting of alternative cooling facilities will be required if, upon complaint filed in accordance with Board rules, it is found at any time that any

heated effluent causes significant ecological damage to the Lake.

- (2) Any effluent source under construction as of January 1, 1971, but not in operation, shall meet all the requirements of Section 1 of this regulation and in addition shall meet the following restrictions:
  - (A) Neither the bottom, the shore, the hypolimnion, nor the thermocline shall be affected by any heated effluent.
  - (B) No heated effluent shall affect spawning grounds or fish migration routes.
  - (C) Discharge structures shall be so designed as to maximize short-term mixing and thus to reduce the area significantly raised in temperature.
  - (D) No discharge shall exceed ambient temperatures by more than 20°F.
  - (E) Heated effluents from more than one source shall not interact.
  - (F) All reasonable steps shall be taken to reduce the number of organisms drawn into or against the intake.
  - (G) Cleaning of condensers shall be accomplished by mechanical devices. If chemicals must be used to supplement mechanical devices, the concentration at the point of discharge shall not exceed the 96-hour TLM for fresh water organisms.
- (3)
  - (A) No source of heated effluent which was not in operation or under construction as of January 1, 1971, shall discharge more than a daily average of 0.1 billion BTU/Hr.
  - (B) Sources of heated effluents which discharge less than a daily average of 0.1 billion BTU/Hr. not in operation or under construction as of January 1, 1971, shall meet all requirements of Sections 1 and 2 of this regulation.

Secondary Contact and Indigenous Aquatic Life Standards

Illinois (Cont'd)

Temperature (STORET numbers - (°F) 00011 and (°C) 00010) shall not exceed 93°F (34°C) more than 5% of the time, or 100°F (37.8°C) at any time.

Iowa:

Warm water fish - 32°C maximum, 3°C increase in streams and 2°C increase in lakes. 1°C/hour rate of change limit.

The allowable 3°C temperature increase criterion for warm water interior streams, 16.3(3)"f"(1), is based in part on the need to protect fish from cold shock due to rapid cessation of heat source and resultant return of the receiving stream temperature to natural background temperature. On low flow streams, in winter, during certain conditions of relatively cold background stream temperature and relatively warm ambient air and groundwater temperature, certain wastewater treatment plants with relatively constant flow and constant temperature discharges will cause temperature increases in the receiving stream greater than allowed in 16.3(3)"f"(1).

During the period November 1 to March 31, for the purpose of applying the 3°C temperature increase criterion, the minimum protected receiving stream flow rate below such discharges may be increased to not more than three times the rate of flow of the discharge, where there is reasonable assurance that the discharge is of such constant temperature and flow rate and continuous duration as to not constitute a threat of heat cessation and not cause the receiving stream temperature to vary more than 3°C per day.

Cold water fish - 20°C maximum, 1°C /hour maximum rate of change; 2°C maximum rise.

No heat shall be added to the Mississippi River that would cause an increase of more than 3°C. The rate of temperature change shall not exceed 1°C per hour.

In addition, the water temperature at representative locations in the Mississippi river shall not exceed the maximum limits in the below table during more than one percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the below table by more than 2°C.

Zone II--Iowa-Minnesota state line to the Northern Illinois border (Mile Point 1534.6)

Zone III--Northern Illinois border (Mile Point 1534.6) to Iowa-Missouri state line.

## Iowa (Cont'd)

Month	Zone II	Zone III
January	4°C	7°C
February	4°C	7°C
March	12°C	14°C
April	18°C	20°C
May	24°C	26°C
June	29°C	29°C
July	29°C	30°C
August	29°C	30°C
September	28°C	29°C
October	23°C	24°C
November	14°C	18°C
December	9°C	11°C

## Kansas:

Man-made sources shall not elevate the temperature of the receiving water above 90°F. Heat of artificial origin shall not be added to a stream in excess of the amount that will raise the temperature of the water more than 5°F above natural conditions. The epilimnion of lakes shall not be raised more than 3°F above that temperature which existed before the addition of heat of artificial origin. The normal daily and seasonal temperature variations before the addition of heat due to other than natural causes shall be maintained. The measurement system used in each case shall provide for temperature measurements which reflect the temperature differential induced after a reasonable mixing zone. A zone of passage for free-swimming and drifting aquatic biota shall be provided for the water affected by each discharge.

Occasional natural thermal conditions may exceed the maximum allowable temperature requirements. Deviations from temperature requirements as a result of waste discharge shall not be allowed without special permission.

## Kentucky:

Temperature shall not exceed 31.7 degrees Celsius (eighty-nine (89) degrees Fahrenheit);

(1) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(2) The maximum temperature rise other than the effects of a mixing zone shall not exceed the natural temperature by 2.8 degrees Celsius, (five (5) degrees Fahrenheit), with a maximum rate of change not to exceed one (1) degree Celsius, (1.8 degrees Fahrenheit), per hour. The department will maintain guidelines for maximum daily average temperatures based on available data. The department may determine that deviations from these guidelines will be allowed upon the submission of adequate supporting data on naturally occurring

Kentucky (Cont'd)

temperatures for a specific location. Furthermore, as a guideline, the water temperature for all surface waters should not exceed the maximum limits shown in the following table:

Table 1

Stream Maximum Temperature  
for Each Month in °F and °C

Month	°F	°C
January	50	10.0
February	50	10.0
March	60	15.6
April	70	21.1
May	80	26.7
June	87	30.6
July	89	31.7
August	89	31.7
September	87	30.6
October	78	25.6
November	70	21.1
December	57	13.9

The allowable temperature increase in impounded waters shall be limited to 1.7 degrees Celsius, (three (3) degrees Fahrenheit), above the natural seasonal norm.

Louisiana:

The temperature standards enumerated in the tables, in most cases, represent maximum values obtained from existing data. However, in a few cases, a limited number of unusually high temperatures in the range of 35°-36° have been deleted as it is felt that these values were recorded during conditions of unseasonably high temperatures and/or unusually low flows or water levels, and, therefore, do not represent normal maximum temperatures..

In order to protect a diversified warm water biota including game fish, the following temperature criteria shall apply (except when natural conditions cause the temperature to be raised above these limits).

The standard shall consist of two parts, a temperature differential and a maximum temperature. The temperature differential represents a maximum permissible rise above ambient conditions. There shall be no addition of artificial heat once the ambient temperature reaches the maximum temperature specified in the standards.

Louisiana (Cont'd)

FRESH WATER - Temperature differential -

- 1) Maximum of 5°F (2.8°C) rise above ambient streams and rivers.
- 2) Maximum of 3°F (1.7°C) rise above ambient for lakes and reservoirs.

MAXIMUM TEMPERATURE - 90°F (32°C) except where otherwise listed in the tables or due to natural conditions.

ESTUARINE AND COASTAL WATERS - Temperature differential -

- 1) Maximum of 4°F (2.2°C) rise above ambient during the period October through May.
- 2) Maximum 1.5°F (0.83°C) during the period June through September.

MAXIMUM TEMPERATURE - 95°F (35°C) except when natural conditions elevate temperature above this level.

These temperature criteria shall not apply to privately owned reservoirs, or reservoirs constructed solely for industrial cooling purposes.

Maine

Freshwater Thermal Discharges

No discharge of pollutants shall cause the ambient temperature of any freshwater body, as measured outside a mixing zone, to be raised more than 5°F or more than 3°F in the epilimnion of any lake or pond. In no event shall any discharge cause the temperature of any freshwater body to exceed 84°F at any point outside a mixing zone established by the board, nor shall such discharge cause the temperature of any waters which presently are designed as trout or salmon waters to exceed 68°F at any point outside a mixing zone established by the board.

Tidal Water Thermal Discharges



Maine (Cont'd)

No discharge of pollutants shall cause the monthly mean of the daily maximum ambient temperatures in any tidal body of water, as measured outside the mixing zone, to be raised more than 4°F nor more than 1.5°F from June 1 to September 1. In no event shall any discharge cause the temperature of any tidal waters to exceed 85°F at any point outside a mixing zone established by the board.

Maryland:

Water Contact Recreation and Aquatic Life - Not greater than 90°F, not greater than 5° above natural for general aquatic life and wildlife.

Shellfish Harvesting Waters - Not greater than 4°F above natural during September through May.

Not greater than 1.5°F above natural during June through August for SHW (Shellfish Harvesting Waters).

Not greater than 68°F for NTW (natural troutwater).

Not greater than 75°F for RTW (recreational).

Nontidal Waters: Trout waters - not to exceed 72°F at any time. All other waters - not to exceed 93°F, elevation of temperature not to exceed 20°F or 10°F depending whether the natural water temperature is below or above 50°F, respectively, with a maximum of 60°F and 93°F, respectively.

Tidal Waters: 90°F max., same temperature change limit as above with absolute max. temperature of 60°F and 90°F.

For all waters not classified for F&WL, no adverse temperature change and max. of 100°F.

Massachusetts:

Class A (excellent) No increase except where temperature will not exceed the  
Class B (Rec. F&WL) recommended limit on the most  
sensitive receiving water use and  
Class C (F&WL) in no case exceed 83°F in warm water  
fish, and 68°F in cold water  
fish, or in any case raise the  
normal temperature more than  
4°F.

All coastal and marine waters - no increase to exceed limits on most sensitive water use.

Michigan

Temperature; general considerations.

Michigan (Cont'd)

(1) In all waters of the state, the points of temperature measurement normally shall be in the surface 1 meter, however, where turbulence, sinking plumes, discharge inertia or other phenomena upset the natural thermal distribution patterns of receiving waters, temperature measurements shall be required to identify the spatial characteristics of the thermal profile.

(2) Monthly maximum temperatures, based on ninetieth percentile occurrence of natural water temperatures plus the increase allowed at the edge of the mixing zone and in part of long-term physiological needs of fish, may be exceeded for short periods when natural water temperatures exceed the ninetieth percentile occurrence. Temperature increases during these periods may be permitted by the commission, but in all cases shall be greater than the natural water temperature plus the increase allowed at the edge of the mixing zone.

(3) Natural daily and seasonal temperature fluctuations of the receiving waters shall be preserved.

Temperature; Great Lakes and connecting waterways.

(1) The Great Lakes and connecting waterways shall not receive a heat load which would warm the receiving water at the edge of the mixing zone more than 3 degrees Fahrenheit above the existing natural water temperature.

(2) The Great Lakes and connecting waterways shall not receive a heat load which would warm the receiving water at the edge of the mixing zone to temperatures in degrees Fahrenheit higher than the following monthly maximum temperatures:

(a) Lake Michigan north of a line due west from the city of Pentwater:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	40	50	55	70	75	75	75	65	60	45

(b) Lake Michigan south of a line due west from the city of Pentwater:

J	F	M	A	M	J	J	A	S	O	N	D
45	45	45	55	60	70	80	80	80	65	60	50

(c) Lake Superior and the St. Marys River:

J	F	M	A	M	J	J	A	S	O	N	D
38	35	39	46	53	61	71	74	71	61	49	42

Michigan (Cont'd)

J	F	M	A	M	J	J	A	S	O	N	D
38	35	39	46	53	61	71	74	71	61	49	42

(d) Lake Huron north of a line due east from Tawas Point:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	40	50	60	70	75	80	75	65	55	45

(e) Lake Huron south of a line due east from Tawas Point, except Saginaw Bay:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	40	55	60	75	80	80	80	65	55	45

(f) Lake Huron, Saginaw Bay:

J	F	M	A	M	J	J	A	S	O	N	D
45	45	45	60	70	75	80	85	78	65	55	45

(g) Lake St. Clair River:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	40	50	60	70	75	80	75	65	55	50

(h) Lake St. Clair:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	45	55	70	75	80	83	80	70	55	45

(i) Detroit River:

J	F	M	A	M	J	J	A	S	O	N	D
40	40	45	60	70	75	80	83	80	70	55	45

(j) Lake Erie:

J	F	M	A	M	J	J	A	S	O	N	D
45	45	45	60	70	75	80	85	80	70	60	50

Temperature: inland lakes, general standards.

Inland lakes shall not receive a heat load which would:

(a) Increase the temperature of the thermocline or hypolimnion or decrease the volume thereof.

(b) Increase the temperature of the receiving waters at the edge of the mixing zone more

than 3 degrees Fahrenheit above the existing natural water temperature.

(c) Increase the temperature of the receiving waters at the edge of the mixing zone to temperatures greater than the following monthly maximum temperatures:

J	F	M	A	M	J	J	A	S	O	N	D
45	45	50	60	70	75	80	85	80	70	60	50

Temperature; inland lakes, anadromous salmonid migrations.

Warmwater inland lakes which serve as principal migratory routes for anadromous salmonids shall not receive a heat load during periods of migration at such locations and in a manner which may adversely affect salmonid migration or raise the receiving water temperature at the edge of the mixing zone more than 3 degrees Fahrenheit above the existing natural water temperature.

Impoundments.

(1) River and stream standards as prescribed by rule 1075 shall apply to all impoundments.

(2) The commission shall determine, when necessary, whether a body of water shall be considered as an inland lake or an impoundment for the purpose of these rules. This determination shall be made partially on the basis of aquatic life resources to be protected.

Temperature, rivers and streams.

(1) Rivers and streams naturally capable of supporting coldwater fish shall not receive a heat load which would:

- (a) Increase the temperature of the receiving waters at the edge of the mixing zone more than 2 degrees Fahrenheit above the existing natural water temperature.
- (b) Increase the temperature of the receiving waters at the edge of the mixing zone to temperatures greater than the following monthly maximum temperatures:

Michigan (Cont'd)

J	F	M	A	M	J	J	A	S	O	N	D
38	38	43	54	65	68	68	68	63	56	48	40

(2) Rivers and streams naturally capable of supporting warmwaterfish shall not receive a heat load which would warm the receiving water at the edge of the mixing zone more than 5 degrees Fahrenheit above the existing natural water temperature.

(3) Rivers and streams naturally capable of supporting warmwater fish shall not receive a heat load which would warm the receiving water at the edge of the mixing zone to temperatures greater than the following monthly maximum temperatures:

(a) Rivers and streams north of a line between Bay City, Midland, Alma, and North Muskegon:

J	F	M	A	M	J	J	A	S	O	N	D
38	38	41	56	70	80	83	81	74	64	49	39

(b) Rivers and streams south of a line between Bay City, Midland, Alma, and North Muskegon, except the St. Joseph River:

J	F	M	A	M	J	J	A	S	O	N	D
41	40	50	63	76	84	85	85	79	68	55	43

(c) St. Joseph River:

J	F	M	A	M	J	J	A	S	O	N	D
50	50	55	65	75	85	85	85	85	70	60	50

(4) Non-trout rivers and streams that serve as principal migratory routes for anadromous salmonids shall not receive a heat load during periods of migration at such locations and in a manner which may adversely affect salmonid migration or raise the receiving water temperature at the edge of the mixing zone more than 5 degrees Fahrenheit above the existing natural water temperature.

Minnesota:

Fisheries and Recreation - Class A - Temperature - No material increase.

Class B - Temperature - 5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature, except in no case shall it exceed the daily average temperature of 86°F.

The following temperature criteria will be applicable for the Mississippi River from Lake Itasca to the outlet of the Metro Wastewater Treatment Works in St. Paul in addition to or superceding the above. The weekly average temperature shall not exceed the following temperatures during the specified months:

January	40°F	July	83°F
February	40°F	August	83°F
March	48°F	September	78°F
April	60°F	October	68°F
May	72°F	November	50°F
June	78°F	December	40°F

For the Mississippi River from Lock and Dam No. 2 at Hastings to the Iowa Border, the weekly average temperature shall not exceed the following temperatures during the specified months:

January	40°F	July	84°F
February	40°F	August	84°F
March	54°F	September	82°F
April	65°F	October	73°F
May	75°F	November	85°F
June	84°F	December	48°F

Class C - Temperature - 5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature except in no case shall it exceed the daily average temperature of 90°F.

The following temperature criteria will be applicable for the Mississippi River from the outlet of the Metro Wastewater Treatment Works in St. Paul to Lock and Dam No.2 at Hastings, in addition to our superceding the above. The weekly average temperature shall not exceed the following temperatures during the specified months:

Minnesota (Cont'd)

January	40°F	July	83°F
February	40°F	August	83°F
March	48°F	September	78°F
April	60°F	October	68°F
May	72°F	November	50°F
June	78°F	December	40°F

Mississippi:

Public Water Supply, Recreation, Fish & Wildlife

Temperature: The maximum temperature rise above natural temperatures before the addition of artificial heat shall not exceed 50°F, in streams, lakes and reservoirs nor shall the maximum water temperature exceed 90°F., except that in the Tennessee River the temperature shall not exceed 86°F. In lakes and reservoirs there shall be no withdrawals from or discharge of heated waters to the hypolimnion unless it can be shown that such discharge will be beneficial to water quality. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained. The discharge of any heated waste into any coastal or estuarine waters shall not raise temperatures more than 4°F. above natural during the period October through May nor more than 1.5°F. above natural for the months June through September. There shall be no thermal block to the migration of aquatic organisms. Requirements for zones of passage as referenced in Section I (8) shall apply. In addition to the general requirements of Section I (2), the temperature shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, temperature criteria will be applied at mid-depth.

In those specific cases where natural conditions elevate the temperatures in excess of the limits expressed herein, Section I (3) shall apply on a case-by-case basis.

Shellfish Harvesting

Temperature: The discharge of any heated waste into any coastal or estuarine waters shall not raise temperatures more than 4°F above natural during the period October through May nor more than 1.5°F. above natural for the months June through September. There shall be no thermal block to the migration of aquatic organisms. Requirements for zones of passage as referenced in Section I (i) shall apply. In addition to the general requirements of Section I (2), the temperatures shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, temperature criteria will be applied as mid-depth. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained.

In those specific cases where natural conditions elevate the temperatures in excess of the limits expressed herein, Section I (3) shall apply on a case-by-case basis.

Mississippi (Cont'd)

mid-depth. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained.

In those specific cases where natural conditions elevate the temperatures in excess of the limits expressed herein, Section I (3) shall apply on a case-by-case basis.

Missouri:

Beyond the mixing zones, effluents shall not elevate or depress the temperature of the stream more than 5°F. The stream temperature shall not exceed 90°F due to effluents.

Cold waters - Effluents shall not elevate or depress the temperature of the stream more than 2°F, nor cause the temperature to exceed 68°F.

Lakes and reservoirs - no measureable temperature increase due to effluents. More restrictive criteria may be required in individual cases, if it can be shown that significant changes in natural biota are resulting.

For the Mississippi River, Zones 1A and 2, the water temperature outside the mixing zone shall not exceed the maximum limits indicated in the following table during more than one percent of the time in any calendar year. The Zone 1B, table limits may not be exceeded more than five percent of the time in a calendar year. At no time shall the river temperature outside of 25% of the cross sectional area or volume of the river exceed the listed limits by more than 3 degrees F. Zone 1A-Des Moines River to Lock and Dam No. 25. Zone 1B-Lock and Dam No. 25 to Lock and Dam No. 26. Zone 2-Lock and Dam No. 26 to the Missouri-Arkansas state line.

	Zone 1A, 1B	Zone 2
January	45 (°F)	50
February	45	50
March	57	60
April	68	70
May	78	80

	Zone 1A, 1B	Zone 2
June	86 (°F)	87
July	88	89
August	88	89
September	86	87
October	75	78
November	65	70
December	52	57

The Commission will consider granting exceptions to these limits. Environmental Protection Agency concurrence will be obtained before an exception is granted.



Missouri (Contd'):	The Commission will consider granting exceptions to these limits. Environmental Protection Agency concurrence will be obtained before an exception is granted.	
Montana:	A-Closed	No increase above naturally occurring water temperature is allowed.
	A-Open-D <sub>1</sub>	A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F; within the naturally occurring range of 66°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 67°F; and where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.
	B-D <sub>1</sub>	A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F; within the naturally occurring range of 66°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 65°F; and where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.
	This applies to all waters in the state classified B-D <sub>1</sub> except for Prickly Pear Creek from McClellan Creek to the Montana Highway No. 433 crossing where a 2°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 65°F; within the naturally occurring range of 65°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 67°F; and where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F.	

A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F; within the natural occurring range of 66°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 67°F, where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.

A 3°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 77°F; within the naturally occurring range of 77°F to 79.5°F, no thermal discharge is allowed which will cause the water temperature to exceed 80°F; and where the naturally occurring water temperature is 79.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.

This applies to all waters in the state classified B-D<sub>3</sub>, except from the Billings water supply intake to the water diversion at Intake, a 3°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 79°F; within the range of 79°F to 81.5°F, no thermal discharge is allowed which will cause the water temperature to exceed 82°F; and where the naturally occurring water temperature is 81.5°F or greater, the maximum allowable increase in water temperature is 0.5°F.

From the water diversion at Intake to the North Dakota state line, a 3°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 82°F; within the range of 82°F to 84.5°F, no thermal discharge is allowed which will cause the water temperature to exceed 85°F; and where the naturally occurring water temperature is 84.5°F or greater, the maximum allowable increase in water temperature is 0.5°F.

Montana (Cont'd):

C-D<sub>1</sub>

A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F; within the naturally occurring range of 66°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 67°F; and where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.

D-D<sub>2</sub>

A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F; within the naturally occurring range of 66°F to 66.5°F, no discharge is allowed which will cause the water temperature to exceed 67°F; and where the naturally occurring water temperature is 66.5°F or greater, the maximum allowable increase in water temperature is 0.5°F. A 2°F per hour is allowed when the water temperature is above 55°F, and a 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F.

E - F

None

Nebraska:

Cold Water Streams - 65°F max., 5°F change from natural outside the mixing zone.

Warm water streams - 90°F max., 5°F change from natural outside the mixing zone.

For impoundments, the epilimnion shall not be raised more than 3°F above that which existed before the addition of heat of artificial origin. No heated discharges to the hypolimnion recommended unless, justified by special study.

Missouri River (Gavins Point Dam to Sioux City, Iowa)  
- 85°F max., 4°F change from natural.

Nevada:

Max. summer values - 30°C to 20°C (varies with stream). Max. winter values - 14°C (varies with stream). (The most stringent value prevails).

A maximum allowable temperature increase above receiving water temperatures is given for each major stream. See the State standards for specific limits.

New Hampshire:

Provisional maximum temperatures recommended as compatible with the well-being of various species of fish and their associated biota indigenous to waters of the Compact area except where specific information may establish that these temperature figures are not applicable in this region or its subregions.

90°F Growth of largemouth bass (*Micropterus salmoides*), blue gill (*Lepomis macrochirus*) and black crappie (*Pomoxis nigromaculatus*).

84°F Growth of yellow perch (*Perca flavescens*), white perch (*Roccus americana*), small-mouth bass (*Micropterus dolomieu*), walleye (*Stizostedion vitreum*) and sauger (*Stizostedion canadense*).

80°F Spawning and egg development of catfish (*Ictalurus punctatus*), yellow bullhead (*Ictalurus natalis*), brown bullhead (*Ictalurus nebulosus*), chain pickerel (*Esox niger*).

75°F Spawning and egg development of largemouth bass (*Micropterus salmoides*).

68°F Spawning and egg development of American shad (*Alosa sapidissima*), growth or migration routes of salmonids, growth of northern pike (*Esox lucius*) and for egg development of white perch (*Roccus americana*) and small-mouth bass (*Micropterus dolomieu*).

55°F Spawning and egg development of brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Salmo gairdnerii*).

48°F Spawning and egg development of lake trout (*Salvelinus namaycush*), walleye (*Stizostedion vitreum*), northern pike (*Esox lucius*), sauger (*Stizostedion canadense*), salmon (*Salmo salar*) and yellow perch (*Perca flavescens*).

New Jersey:

General Requirements: Temperature shall be measured outside of designated heat dissipation areas (see Mixing Zone Digest). The rate of temperature change in designated heat dissipation areas shall not cause mortality of fish.

FW-1. Preserve natural conditions.

FW-2. (PWS) - Trout production - No change except 1° rise where treated effluents are discharged.

Trout maintenance streams - 68°F maximum, 2° rise.  
Reduction in temperature may be permitted where it can be shown that trout will benefit without detriment to other designated uses.

Trout maintenance lakes - No change unless shown beneficial.

Non-trout - 86°F maximum. (82°F max. in yellow perch or smallmouth bass areas.) Max. change 5° in streams, 3° in epilimnion of lakes. Unless a study shows that a heated discharge into the hypolimnion or pumping water from the hypolimnion will be desirable for designated water use, such practices shall not be permitted.

FW-3. (F&WL, rec.) Same as FW-2.

TW-1. (Tidal: PWS, shellfish, rec.) Trout maintenance streams - Same as FW-2.

Non-trout waters - 85°F max. (82° max. in yellow perch areas); max. rise (measured against monthly mean of daily max. temp.) 4° Sept-May, 1.5° June-Aug.

TW-2. (Secondary rec., fish maintenance.) - 85°F.  
max.; max. rise same as TW-1.

TW-3. (Nav., fish survival & passage) - Same as TW-2.

CW-1. (Ocean near shore: primary rec., F&WL) - No direct heat additions. As a result of any heat which may be added elsewhere, max. rise shall be the same as TW-1. 80°F max.

CW-2. (Ocean beyond CW-1) - 80° max., max. rise same as TW-1.

Delaware River

Zone 1 (non-tidal to head of tide R.M. 133.4) 87°F max., 5°F rise.

New Jersey (Cont'd)

Zone 2 (R.M. 133.4 to R.M. 108.4) 86°F max., 5°F rise.

Zone 3 (R.M. 108.4 to R.M. 95.0) same as Zone 2.

Zone 4 (R.M. 95.0 to R.M. 78.,8) same as Zone 2.

Zone 5 (R.M. 78.2 to R.M. 48.2) 86° max., 4°F rise - Sept. - May, 1.5°F rise - June - Aug.

Zone 6 (R.M. 48.2 to R.M. 0.0 ATLANTIC OCEAN) 85°F max., rise - same as Zone 5.

New Mexico

Temperature - Maximum temperatures for each stream reach have been specified in Part G of these standards. However, the introduction of heat by other than natural causes shall not increase the temperature, as measured from above the point of introduction, by more than 2.7°C (5°F) in a stream, or more than 1.7°C (3°F) in a lake or reservoir. In no case will the introduction of heat be permitted when the maximum temperature specified for the reach [generally 20°C (68°F) for cold water fisheries and 32.2°C (90°F) for warm water fisheries] would thereby be exceeded. These temperature standards shall not apply to impoundments constructed offstream for the purpose of heat disposal. High water temperatures caused by unusually high ambient air temperatures or the reasonable operation of irrigation and aquacultural facilities are not violations of these standards.

New York

Temperature

Trout Waters - 70°F max. within mixing zone, 2°F change June-Sept., 50°F max., 5° change Oct-May.

Non-trout Waters - 90°F max, within mixing zone, 86°F max., 5°F change.

Lakes - 3°F rise at surface; temperature rise confined to epilimnion of stratified lakes, temperature lowering confined to hypolimnion.

Coastal - 4°F change Oct-June; 1.5°F change July-Sept.

Estuarine - 90°F max. at surface within mixing zone; 83°F max., 4° change, except July-Sept., if temp. naturally more than 83°F then 1.5°F rise.

Enclosed Bays - Only naturally occurring temperature changes.

North Carolina

Class A-II (PWS) 5.04°F change limit, maximum of  
Class B 84.2°F for the mountains and upper  
Class C piedmont, maximum of 89.6°F for  
lower piedmont and coastal plain.

Trout waters shall not exceed 68°  
and shall not be increased by .9°F  
as a result of the discharge of  
heated liquids.

Class SA (Shell.) Allowable rise of 1.44°F during  
Class SB June, July, and August. 3.96°F  
Class SC remaining months.

Not to exceed 89.6°F due to the  
discharge of heated effluents.

North Dakota

85°F maximum, allowable rise 5°F above natural.

Ohio

Warmwater Habitat: (a) There shall be no water  
temperature changes as a result of human activity  
that cause mortality, long-term avoidance, exclusion  
from habitat, or adversely affect the reproductive  
success of representative aquatic species, unless  
caused by natural conditions.

(b) At no time shall water temperature exceed a  
monthly or bi-weekly average, or at any time exceed  
the daily maximum temperature as indicated in Table  
5b through 5j. The average and daily maximum  
temperature standard shall apply and be measured  
outside of a thermal mixing zone at any point on a  
thermal mixing zone boundary as such is defined in  
Rule 3745-1-06(B)(1) and (2) of the Ohio Administra-  
tive Code.

Exceptional Warmwater Habitat and Coldwater Habitat:  
Temperature - At no time shall the water temperature  
exceed the temperature which would occur if there  
were no temperature change attributable to man's  
activities.

Seasonal Warmwater Habitat: At no time shall the  
water temperature exceed the daily maximum  
temperature as indicated in Table 5a.

Ohio (Cont'd) Table 5a: Seasonal daily maximum temperatures limitations for Seasonal Warmwater Habitat. Shown as Degrees Fahrenheit and Celsius.

<u>Month</u>	<u>Daily Maximum</u>
January	70 (21.1)
February	70 (21.1)
March	75 (23.9)
April	80 (26.7)
May	84 (28.9)
June	89 (31.7)
July	89 (31.7)
August	89 (31.7)
September	89 (31.7)
October	84 (28.9)
November	76 (24.4)
December	70 (21.1)

TABLE 5

Temperature

Table 5b: General Ohio River Basin - includes all waters of the state within the boundaries of the Ohio River basin, excluding those water bodies or water body segments as designated in Table 5c through 5f, and Table 5a. Shown as degrees Fahrenheit and Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	47 (8.3)	47 (8.3)	51 (10.0)	54 (12.2)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	74 (23.3)
Daily Maximum:	52 (11.1)	52 (11.1)	56 (13.3)	59 (15.0)	65 (18.3)	70 (21.1)	73 (22.8)	76 (24.4)	80 (26.7)
	<u>June 16-31</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	82 (27.8)	82 (27.8)	82 (27.8)	82 (27.8)	73 (22.8)	71 (21.7)	65 (18.3)	60 (15.6)	47 (8.3)
Daily Maximum:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	78 (25.6)	76 (24.4)	70 (21.1)	65 (18.3)	52 (11.1)



Ohio (Cont'd) Table 5c: Lower Great Miami River - Steele Dam in Dayton (River Mile 81.3) to the confluence with the Ohio River. Shown as degrees Fahrenheit and Celsius.

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
Average:	49 (9.4)	49 (9.4)	53 (11.9)	56 (13.3)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	75 (23.9)
Daily Maximum:	54 (12.2)	54 (12.2)	58 (14.4)	61 (16.1)	68 (20.0)	74 (23.3)	77 (25.0)	79 (26.1)	83 (28.3)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	78 (25.6)	71 (21.7)	66 (18.9)	63 (17.2)	49 (9.4)
Daily Maximum:	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	83 (28.3)	76 (24.4)	71 (21.7)	68 (20.0)	54 (12.2)

Table 5d: Scioto River - Griggs Dam in Columbus (River Mile 136) to the confluence with the Ohio River. Shown as degrees Fahrenheit and Celsius.

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
Average:	47 (8.3)	47 (8.3)	51 (10.6)	54 (12.2)	59 (15.0)	62 (16.7)	67 (19.4)	72 (22.2)	75 (23.9)
Daily Maximum:	52 (11.1)	52 (11.1)	56 (13.3)	59 (15.0)	65 (18.3)	70 (21.1)	75 (23.9)	79 (26.1)	82 (27.8)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
Average:	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	71 (21.7)	65 (18.3)	58 (14.4)	47 (8.3)
Daily Maximum:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	80 (26.7)	76 (24.4)	70 (21.1)	63 (17.2)	52 (11.1)

Ohio Table 5e: Hocking River - entire mainstem. Shown as degrees Fahrenheit and  
(Cont'd) Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	45 (7.2)	45 (7.2)	51 (10.6)	56 (13.3)	59 (15.0)	65 (18.3)	67 (19.4)	70 (21.1)	74 (23.3)
Daily Maximum:	50 (10.0)	50 (10.0)	56 (13.3)	61 (16.1)	66 (18.9)	70 (21.1)	73 (22.8)	76 (24.4)	80 (26.7)
	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	77 (25.0)	65 (18.3)	62 (16.7)	58 (14.4)	45 (7.2)
Daily Maximum:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	82 (27.8)	70 (21.1)	67 (19.4)	63 (17.2)	50 (10.0)

Table 5f: Muskingum River - entire mainstem. Shown as degrees Fahrenheit and Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	45 (7.2)	45 (7.2)	53 (11.7)	53 (11.7)	58 (14.4)	65 (18.3)	68 (20.0)	72 (22.2)	76 (24.4)
Daily Maximum:	50 (10.0)	50 (10.0)	58 (14.4)	58 (14.4)	63 (17.2)	70 (21.1)	74 (23.3)	77 (25.0)	84 (28.9)
	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	73 (22.8)	67 (19.4)	62 (16.7)	47 (8.3)
Daily Maximum:	87 (31.7)	87 (31.7)	87 (31.7)	87 (31.7)	80 (29.4)	76 (25.0)	70 (22.2)	63 (19.4)	52 (11.1)

Ohio  
(Cont'd)

Table 5g: General Lake Erie Basin - includes all surface waters of the state within boundaries of the Lake Erie drainage basin, excluding those water bodies as designated in Tables 5h through 5j, and Table 5a. Shown as degrees Fahrenheit and Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	44 (6.7)	44 (6.7)	48 (8.9)	51 (10.6)	54 (12.2)	60 (15.6)	64 (17.8)	66 (18.9)	72 (22.2)
Daily Maximum:	49 (9.4)	49 (9.4)	53 (11.7)	56 (13.3)	61 (16.1)	65 (18.3)	69 (20.6)	72 (22.2)	76 (24.4)
	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	82 (27.8)	82 (27.8)	82 (27.8)	82 (27.8)	75 (23.9)	67 (19.4)	61 (16.1)	54 (12.2)	44 (6.7)
Daily Maximum:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	72 (22.2)	66 (18.9)	59 (15.0)	49 (9.4)

Table 5h: Maumee River - Ohio-Indiana state line Maumee River estuary. Shown as degrees Fahrenheit Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	45 (7.2)	45 (7.2)	47 (8.3)	53 (11.7)	58 (14.4)	61 (16.1)	67 (19.4)	70 (21.1)	75 (23.9)
Daily Maximum:	50 (10.0)	50 (10.0)	52 (11.1)	58 (14.4)	63 (17.2)	68 (20.0)	72 (22.2)	76 (24.4)	80 (26.7)
	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	85 (29.4)	85 (29.4)	85 (29.4)	85 (29.4)	80 (26.7)	71 (21.7)	65 (18.3)	58 (14.4)	45 (7.2)
Daily Maximum:	89 (31.7)	89 (31.7)	89 (31.7)	89 (31.7)	85 (29.4)	76 (24.4)	70 (21.1)	63 (17.2)	50 (10.0)

Ohio Table 5i: Maumee Bay - includes all waters of the state known as Maumee Bay  
(Cont'd) including the Maumee River estuary and the estuary portions of all  
tributaries entering Maumee Bay to the mean Lake Erie mean high  
water level. Shown as degrees Fahrenheit and Celsius.

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
Average:	47 (8.3)	47 (8.3)	48 (8.9)	50 (10.0)	52 (11.1)	57 (13.9)	61 (16.1)	65 (18.3)	71 (21.7)
Daily Maximum:	52 (11.1)	52 (11.1)	53 (11.7)	54 (12.2)	59 (15.0)	63 (17.2)	66 (18.9)	76 (24.2)	77 (25.0)
	<u>June</u> <u>16-30</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
Average:	83 (29.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	69 (20.6)	64 (17.8)	59 (15.0)	47 (8.3)
Daily Maximum:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	80 (26.7)	74 (23.3)	69 (20.6)	64 (17.8)	52 (11.1)

Table 5j: Sandusky Bay - includes all waters of the state known as Sandusky  
Bay including the Sandusky River estuary and the estuary portions  
of all tributaries entering Sandusky Bay to the Lake Erie mean  
high water level. Shown as degrees Fahrenheit and Celsius.

	<u>Jan.</u> <u>1-31</u>	<u>Feb.</u> <u>1-29</u>	<u>Mar.</u> <u>1-15</u>	<u>Mar.</u> <u>16-31</u>	<u>Apr.</u> <u>1-15</u>	<u>Apr.</u> <u>16-30</u>	<u>May</u> <u>1-15</u>	<u>May</u> <u>16-31</u>	<u>June</u> <u>1-15</u>
Average:	47 (8.3)	47 (8.3)	48 (8.9)	50 (10.0)	52 (11.1)	57 (13.9)	63 (17.2)	68 (20.0)	74 (23.3)
Daily Maximum:	52 (11.1)	52 (11.1)	53 (11.7)	55 (12.8)	57 (13.9)	62 (16.7)	68 (20.0)	73 (22.8)	79 (26.1)
	<u>June</u> <u>16-31</u>	<u>July</u> <u>1-31</u>	<u>Aug.</u> <u>1-31</u>	<u>Sept.</u> <u>1-15</u>	<u>Sept.</u> <u>16-30</u>	<u>Oct.</u> <u>1-15</u>	<u>Oct.</u> <u>16-31</u>	<u>Nov.</u> <u>1-30</u>	<u>Dec.</u> <u>1-31</u>
Average:	83 (28.3)	83 (28.3)	83 (28.3)	83 (28.3)	75 (23.9)	69 (20.6)	64 (17.8)	59 (15.0)	47 (8.3)
Daily Average:	87 (30.6)	87 (30.6)	87 (30.6)	87 (30.6)	80 (26.7)	74 (23.3)	69 (20.6)	64 (17.8)	52 (11.1)

Ohio (Cont'd) Table 1: Daily average temperatures of thermal mixing zones at corresponding ambient temperatures as required in Section (B)(1) of this rule. Shown as degrees Fahrenheit and Celsius.

<u>Ambient- °F (°C)</u>	<u>Daily Average Temperature-°F (°C)</u>	<u>Ambient- °F (°C)</u>	<u>Daily Average Temperature-°F (°C)</u>
32(0)	50(10.0)	48(8.9)	71(21.7)
33(0.6)	50(10.0)	49(9.4)	73(22.8)
34(1.1)	50(10.0)	50(10.0)	75(23.9)
35(1.7)	50(10.6)	51(10.6)	76(24.4)
36(2.2)	52(11.1)	51(11.1)	78(25.6)
37(2.8)	54(12.2)	53(11.7)	79(26.1)
38(3.3)	55(12.8)	54(12.2)	81(27.2)
39(3.9)	57(13.9)	55(12.8)	83(28.3)
40(4.4)	58(14.4)	56(13.3)	85(29.4)
41(5.0)	60(15.6)	57(13.9)	86(30.0)
42(5.6)	62(16.7)	58(14.4)	88(31.1)
43(6.1)	63(17.2)	59(15) and above - daily average limit will be determined on a case-by-case basis pursuant to Rule 3745-1-06(B)(1) and (2)	
44(6.7)	65(18.3)		
45(7.2)	66(18.9)		
46(7.8)	68(20.0)		
47(8.3)	70(21.1)		

LAKE ERIE

Temperature: (a) There shall be no water temperature changes as a result of human activity that cause mortality, long-term avoidance, exclusion from habitat, or adversely affect the reproductive success of representative aquatic species, unless caused by natural conditions.

(b) At no time shall water temperature exceed a monthly or bi-weekly average, or at any time exceed the daily maximum temperature as indicated in Table 7a and 7b. The average and daily maximum temperature standards shall apply and be measured outside of a thermal mixing zone at any point on a thermal mixing boundary at

Ohio  
(Cont'd)

depths greater than three feet, as defined in Rule 3745-1-11(B)(2)(a) and (b) of the Ohio Administrative Code.

(c) The temperature of the hypolimnetic waters of Lake Erie shall not exceed at any time a daily maximum as indicated in Table 7c.

Table 7a: Lake Erie Western Basin - includes the area of Lake Erie west of a line drawn from Pelee Point, Canada to Scott Point on Catawba Island. Shown as degrees Fahrenheit and Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	-	-	-	-	-	53 (11.7)	59 (15.0)	65 (18.3)	75 (23.9)
Daily Maximum:	35 (1.7)	38 (3.3)	39 (3.9)	45 (7.2)	51 (10.6)	56 (13.3)	64 (17.8)	72 (22.2)	78 (25.6)
	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	80 (26.7)	83 (28.3)	83 (28.3)	78 (25.6)	76 (24.4)	66 (18.9)	60 (15.6)	53 (11.7)	-
Daily Maximum:	83 (28.3)	85 (29.4)	85 (29.4)	83 (28.3)	81 (27.2)	71 (21.7)	65 (18.3)	58 (14.4)	46 (7.8)

Table 7b: Lake Erie Central Basin - includes the area of Lake Erie east of a line drawn from Pelee Point, Canada to Scott Point on Catawba Island to the Pennsylvania-Ohio state line. Shown as degrees Fahrenheit and Celsius.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	-	-	-	-	43 (6.1)	53 (11.7)	59 (15.0)	63 (17.2)	75 (23.9)
Daily Average:	35 (1.7)	38 (3.3)	39 (3.9)	45 (7.2)	48 (8.9)	56 (13.3)	63 (17.2)	72 (22.2)	78 (25.6)

Ohio (Cont'd)	<u>June 16-30</u>	<u>July 1-31</u>	<u>Aug. 1-31</u>	<u>Sept. 1-15</u>	<u>Sept. 16-30</u>	<u>Oct. 1-15</u>	<u>Oct. 16-31</u>	<u>Nov. 1-30</u>	<u>Dec. 1-31</u>
Average:	80 (26.7)	83 (28.3)	83 (28.3)	76 (24.4)	71 (21.7)	66 (18.9)	58 (14.4)	48 (8.9)	-
Daily Maximum:	83 (28.3)	85 (29.4)	85 (29.4)	81 (27.2)	76 (24.4)	71 (21.7)	63 (17.2)	53 (11.7)	46 (7.8)

Table 7c: Seasonal daily maximum temperature limitations for the hypolimnetic regions of Lake Erie. Shown as degrees fahrenheit and celcius.

<u>Month</u>	<u>Daily Maximum</u>
January	44 (6.7)
February	44 (6.7)
March	44 (6.7)
April	47 (8.3)
May	51 (10.6)
June	54 (12.2)
July	59 (15.0)
August	59 (15.0)
September	55 (12.8)
October	46 (7.8)
November	41 (5.0)
December	38 (3.3)

Ohio  
 (Cont'd)

Table 7d: Daily average temperatures of thermal mixing zones at corresponding ambient temperatures as required in Section (B)(1) of this rule. Shown as degrees Fahrenheit and Celsius.

<u>Ambient</u>	<u>Daily Average Temperature</u>	<u>Ambient</u>	<u>Daily Average Temperature</u>
32(0)	41(5.0)	46(7.8)	65(18.3)
33(0.6)	41(5.0)	47(8.3)	66(18.9)
34(1.1)	43(6.1)	48(8.9)	68(20.0)
35(1.7)	45(7.2)	49(9.4)	70(21.1)
36(2.2)	46(7.8)	50(10.0)	71(21.70)
37(2.8)	48(8.9)	51(10.6)	73(22.8)
38(3.3)	50(10.0)	52(11.1)	75(23.9)
39(3.9)	52(11.1)	53(11.7)	77(25.0)
40(4.4)	53(11.7)	54(12.2)	78(25.6)
41(5.0)	55(12.8)	55(12.8)	80(26.7)
42(5.6)	57(13.9)	56(13.3)	82(27.2)
43(6.1)	59(15.0)	57(13.9)	84(28.9)
44(6.7)	61(16.1)	58(14.4)	86(30.0)
45(7.2)	62(16.7)	59(15) and above - daily average limit will be determined on a case-by-case basis.	

Table 7e: Lake Erie Excepted Areas - includes all water of Lake Erie designated in Division (C) of this rule, excluding Maumee Bay and Sandusky Bay, Tables 5i and 5j. Temperatures within mixing zones shall comply with Table 1.

	<u>Jan. 1-31</u>	<u>Feb. 1-29</u>	<u>Mar. 1-15</u>	<u>Mar. 16-31</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May 1-15</u>	<u>May 16-31</u>	<u>June 1-15</u>
Average:	-	-	-	-	-	-	-	-	-
Daily Maximum:	52 (11.1)	52 (11.1)	55 (12.8)	55 (12.8)	59 (15.0)	63 (17.2)	66 (18.9)	76 (24.4)	82 (27.8)



Ohio (Cont'd)	June 16-31	July 1-31	Aug. 1-31	Sept. 1-15	Sept. 16-30	Oct. 1-15	Oct. 16-31	Nov. 1-30	Dec. 1-31
Average:	84 (28.9)	84 (28.9)	84 (28.9)	84 (28.9)	-	-	-	-	-
Daily Maximum:	88 (31.1)	88 (31.1)	88 (31.1)	88 (31.1)	84 (28.9)	75 (23.9)	70 (21.1)	65 (18.3)	55 (12.8)

Ohio River      Temperature: Maximum rise above natural temperature shall not exceed 5 deg. F, in addition the allowable maximum temperature during a month shall not exceed:

<u>Month</u>	<u>Temperature deg. F</u>	<u>Month</u>	<u>Temperature deg. F</u>
January	50	July	89
February	50	August	89
March	60	September	87
April	70	October	78
May	80	November	70
June	87	December	57

Water temperature shall not exceed the maximum limits in the above table during more than one percent of the hours in the 12-month period ending with any month, at no time shall the water temperature at such locations exceed the maximum limits in the table by more than 3 deg. F.

Mahoning River Basin      The Mahoning River upstream of the Leavittsburg Dam and all tributaries except the Little Squaw Creek downstream of Highway I-80, Hines Run downstream of Lowellville Road, Mosquito Creek downstream of Federal Street in Niles; the last 200 yards of Yellow Creek.

For Aquatic Life (Warmwater Fishery)

Temperature: (a) No abnormal temperature changes that may affect aquatic life unless caused by natural conditions.

(b) The maximum temperature shall not exceed natural temperatures by more than 5°F provided that at no time shall they exceed those indicated in the following table:

Ohio  
(Cont'd)

Maximum Temperature in Deg. F. During Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
50	50	60	70	80	90	90	90	90	78	70	57

Lower Mahoning River

		<u>Mile Points from Mouth</u>	
		<u>Beginning</u>	<u>Ending</u>
1	Leavittsburg Dam to Main St. in Warren	46.08	38.08
2	Main St. in Warren to the Lowellville Dam	38.08	12.81
3	Lowellville Dam to the Ohio-Pa state line	12.81	11.61

(3) CERTAIN TRIBUTARIES TO WHICH THIS REGULATION APPLIES ARE:

- (a) Mosquito Creej from Federal Street in Niles to its mouth
- (b) Little Squaw Creek from Highway I-80 to its mouth
- (c) Hines Run, from Lowellville Road to its mouth
- (d) Yellow Creek, the last 200 yards to its mouth

For General Aquatic Life (warmwater fishery)

Temperature: (i) No abnormal temperature changes that adversely effect aquatic life.

(ii) At no time shall the temperature exceed those values indicated in the following table:

Maximum Temperature in Deg. F. During Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug</u>	<u>Sept</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
56	56	62	71	80	90	90	90	90	78	69	58

For Industrial Water Supply

Temperature: Not to exceed 100°F

Ohio Lower Cuyahoga River  
(Cont'd)

In that portion of the Cuyahoga River extending from the confluence of the Cuyahoga River and Big Creek to the mouth of the Cuyahoga River, at no time shall water temperature exceed the maximum temperatures indicated in the following table.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Deg. F.	53	53	63	73	83	95	95	95	95	83	73	60
Deg. C.	11.7	11.7	17.2	22.8	28.3	35.0	35.0	35.0	35.0	28.3	22.8	15.5

Oklahoma:

At no time shall heat be added to any stream in excess of the amount that will raise the temperature of the receiving water more than 5°F. In streams, temperature determinations shall be made by averaging representative temperature measurements of the cross sectional area of streams at the end of the mixing zone.

In lakes, the temperature of the water column and/or epilimnion, if thermal stratification exists, shall not be raised more than 3°F above that which existed before the addition of heat of artificial origin, based upon the average of temperatures taken from surface to the bottom or surface to the bottom of the epilimnion, if stratified.

The normal daily and seasonal variations that were present before the addition of heat from other than natural sources shall be maintained. The maximum temperature due to man-made causes shall exceed 68°F in trout streams and lakes except in the segment of Arkansas River from Kaw Reservoir to the headwaters of Keystone Reservoir where maximum temperature shall not exceed 94°F.

No artificial heat shall be added such that the receiving water temperature exceeds the maximums specified above.

Privately owned lakes and reservoirs used in the process of cooling water for industrial purposes, are not classified as waters of the State, (See Appendix C) and are exempt from these temperature restrictions, provided the water released from any such lake or reservoir into a stream system shall meet the water quality standards of the receiving stream.

Oregon:

(Since the numerical limits of this standard differ among the 19 river basins, these limits have been left blank to avoid confusion.) No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are \_\_\_°F or greater, or more than 0.5°F increase due to a single source discharge when receiving water temperatures are \_\_\_°F or

Oregon (Cont'd)

less, or more than 2°F increase due to all sources combined when stream temperatures are \_\_\_°F or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accomodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses.

The present temperature values given below are to be placed in the blanks in the preceding language.

	<u>F°</u>
North Coastal-Lower Columbia Basin	68, 67.5, 66
Mid Coast Basin	64, 63.5, 62
Umpqua Basin	58, 57.5, 56
South Coast Basin	64, 63.5, 62
Rogue Basin	58, 57.5, 56
Willamette Basin	
Multnomah Channel and Main Stem of	
Willamette River (mouth to R.M. 50)	70, 69.5, 68
Willamette River (Newberg to R.M. 187)	64, 63.5, 62
All other Willamette Basin streams:	
Salmonid	58, 57.5, 56
Non-Salmonid	64, 63.5, 62
Columbia River	68, 67.5, 66
Sandy Basin	
Main Stem Columbia River (R.M. 120-147)	68, 67.5, 66
All other Basin Waters	58, 57.5, 56
Hood Basin	
Columbia River (R.M. 147-203)	68, 67.5, 66
Other Hood River Basin streams	58, 57.5, 56
Deschutes Basin	
Columbia River (R.M. 203-218)	68, 67.5, 66
Other Deschutes River Basin streams	58, 57.5, 56
John Day Basin	68, 67.5, 66
Umatilla Basin	68, 67.5, 66
Walla Walla Basin	68, 67.5, 66
Grand Ronde Basin	68, 67.5, 66
Powder Basin	68, 67.5, 66
Malheur River Basin	68, 67.5, 66
Malheur Lake Basin	68, 67.5, 66
Goose and Summer Lakes Basin	
Goose Lake	Daily average temperatures shall not exceed 70°F, or the daily mean ambient air temp- erature, which- ever is greater.

Oregon (Cont'd)	All other Waters	68, 67.5, 66
	Klamath Basin	
	Salmonid	58, 57.5, 56
	Non-Salmonid	72, 71.5, 70

Pennsylvania: Temp1 No rise when ambient temperature is 58°F or above; not more than 5°F rise above ambient temperature until stream temperature reaches 58°F; not to be changed by more than 2°F during any one-hour period.

Temp2 No rise when ambient temperature is 87°F or above; not more than a 5°F rise above ambient temperature until stream temperature reaches 87°F; not to be changed by more than 2°F during any one-hour period.

Temp3 For the period 2/15 to 7/31, no rise when ambient temperature is 74°F or above; not more than 5°F rise above ambient temperature until stream temperature reaches 74°F, not to be changed by more than 2°F during any one-hour period; for the remainder of the year, no rise when ambient temperature is 87°F or above; not more than a 5°F rise above ambient temperature until stream temperature reaches 87°F, not to be changed by more than 2°F during any one-hour period.

Temp4 Not to exceed the following temperatures in the month indicated:

<u>Month</u>	<u>Temperature, °F</u>
January	56
February	56
March	62
April	71
May	80
June	90
July	90
August	90
September	90
October	78
November	69
December	58

Temp5 Not more than 5°F above the average daily temperature during the 1961-66 period, which is shown below, or a maximum of 86°F, whichever is less.

Pennsylvania (Cont'd)

Average Daily Temperature  
1961-1966  
(Temperatures may be interpolated)

Delaware Estuary, Head of Tide to River Mile 108.4 (about 1 mile below Pennypack Creek)		Delaware Estuary, River Mile 108.4 (about 1 mile below Pennypack Creek) to Big Timber Creek		Delaware Estuary, from Big Timber Creek to Pennsylvania-Delaware State Line	
<u>Date</u>	<u>°F</u>		<u>°F</u>		<u>°F</u>
January 1	37		41		42
February 1	35		35		36
March 1	38		38		40
April 1	46		46		47
May 1	58		58		58
June 1	71		71		72
July 1	79		79		80
August 1	81		81		81
September 1	78		79		78
September 15	76		77		76
October 1	70		70		70
November 1	59		61		60
December 1	46		50		50
December 15	40		45		45

Temp6

Not more than 5°F rise above the ambient temperatures until stream temperatures reach 50°F, nor more than 2°F rise above ambient temperature when temperatures are between 50°F and 58°F, nor shall temperatures exceed 58°F., whichever is less except in designated heat dissipation areas.

Temp7

As a guideline, the maximum length of heat dissipation areas shall not be longer than 3,500 feet measured from the point where the waste discharge enters the stream. The width of heat dissipation areas shall not exceed two-thirds the surface width measured from shore to shore at any stage of tide or the width encompassing one-fourth the cross-sectional area of the stream, whichever is less. Within any one heat dissipation area only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect stream uses. Controlling temperatures shall be measured outside the heat dissipation area. The rate of temperature change in the heat dissipation area shall not cause mortality of the fish.

Temp8

As a guideline, the maximum length of heat dissipation areas shall not be longer than 3,500 feet or 20 times the average stream width, whichever is less, measured from the point where the waste discharge enters the stream. Heat dissipation areas shall not exceed one-half the surface stream width or the width encompassing one-half of the entire cross-sectional areas of the stream, whichever is less. Within any one heat dissipation area, only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect water uses. Controlling temperatures shall be measured outside the heat dissipation zone. The rate of temperature change in designated heat dissipation areas shall not cause mortality of the fish.

Temp9

As a guideline, the maximum length of heat dissipation areas shall not be longer than 1,000 feet or 20 times the average width of the stream, whichever is less, measuring from the points where the waste discharge enters the stream. Heat dissipation areas shall not exceed one-half the surface stream width or the width encompassing one-half of the entire cross-sectional area of the stream, whichever is less. Within any one heat dissipation area, only one shore shall be used in determining the limits of the area. Where waste discharges are close to each other, additional limitations may be prescribed to protect water uses. Controlling temperatures shall be measured outside the heat dissipation zone. The rate of temperature change in designated heat dissipation areas shall not cause mortality of the fish.

Puerto Rico:

- SA - 94°F max., No heat may be added which causes monthly arithmetic means of the maximum daily temperature of any site to be exceeded by more than 1.5°F.
- SB - No discharge or combination of discharges shall be injurious to fish or shellfish or the culture or propagation of a balanced indigenous population (nor in any way affect desired use.)
- SC - Thermal discharges shall be confined to the epilimnetic layer of stratified lakes.
- SD - The rate of temperature change shall not exceed 1°F per hour and not exceed a total of 5°F in any 24 hour period except from natural causes.

Rhode Island:

- Class A (Excellent) - no increase from other than natural causes.
- Class B (Rec.) - Only such increases that will not impair any usages specifically assigned to this class. The temperature increase shall not raise the temperature of the receiving waters above the recommended limit on the most sensitive receiving water use and in no case exceed 83°F. In no case shall the temperature of the receiving water be raised more than 4°F. Heated discharges into designated trout habitats shall not raise the temperature above 50°F during October to 15 June nor greater than 54°F, 15 June through September.
- Class C (F&WL) - Only such increases that will not impair any usages specifically assigned to this Class or causes the growth of unfavorable species of biota.
- Class D (Nav, Power) - No case exceed 90°F.
- Class SA(Shell.)                    ) no increase over the recom-
- Class SB(Bathing)                   ) mended limits for the most
- Class SC(Shell,habitat)            ) sensitive use nor exceed 83°F
- ) or raise the normal tempera-
- ) ture more than 1.5°F June 15
- ) through Sept. or 4°F Oct.
- ) through June 15.



South Carolina: AA - Trout - not above natural conditions: All other fresh waters - 90°F max., 5°F rise. All fresh water lakes limited to same maximum temperatures and 5°F rise. Tidal waters - 4°F rise during fall, winter and spring, 1.5°F rise during summer.

South Dakota: Cold water permanent fish - 65°F max.  
Cold water marginal fish - 75°F max.  
Warm water permanent fish - 80°F max.  
Warm water semipermanent - 90°F max.  
Warm water marginal fish - 90°F max.

Temperature change in fish life propagation waters. No discharge or discharges shall affect the temperature by more than 4°F in streams classified for the beneficial use of cold water permanent, cold water marginal, or warm water permanent fish life propagation; by more than 5°F in streams classified for the beneficial use of warm water semipermanent or warm water marginal fish life propagation; or by more than 3°F in lakes or impoundments classified for the beneficial use of fish life propagation. Exceptions to this criterion may be granted by the Board if such discharge will not impair the beneficial use of fish life propagation. In addition, the maximum incremental temperature shall not exceed 2°F per hour. There shall be no induced temperature change over spawning beds.

Fish & Aquatic Life - Same as above with: The temperature of recognized trout waters shall not exceed 20°C. There shall be no abnormal temperature changes that may affect aquatic life unless caused by natural conditions.

Irrigation - The temperature of the water shall not be raised or lowered to such an extent as to interfere with its use for irrigation purposes.

Livestock Watering and Wildlife and Navigation - The temperature of water shall not be raised or lowered to such an extent as to interfere with its use for "livestock watering and wildlife." (Same with "navigation" substituted.)

Texas The temperature limitations are intended to be applied with judgement and are applicable to the waters specifically identified herein with the qualifications enumerated in Section VIII. Temperature standards are composed of two parts, a maximum temperature and a maximum temperature differential attributable to heated effluents.

Texas (Cont'd)

Natural high temperatures, in excess of 96°F, occur regularly in Texas waters during the summer months. For example, 2.3% of United States Geological Survey measurements made during the summer months on the Double Mountain Fork of the Brazos River near Aspermont, Texas, during the period 1958 through 1971 exceeded 96°F. It is consequently concluded that the 90°F maximum temperature suggested by the National Technical Advisory Committee is not applicable to Texas conditions.

Fresh Water Streams:

Maximum Temperature	See Table for Specific Waters
Maximum Temp. Diff.	5°F rise over ambient

Fresh Water Impoundments:

Maximum Temperature	See Table for Specific Waters
Maximum Temp. Diff.	3°F rise over ambient

Tidal River Reaches, Bay and Gulf Waters:

	<u>Fall, Winter, Spring</u>	<u>Summer</u>
Maximum Temp. Diff.	4°F	1.5°F
Maximum Temperature	95°F	95°F

See Standards for segment Max. Temperature.

Utah:

Cold water fish - 20°C max., 2°C change limit.  
 Warm water fish - 27°C max., 4°C change limit.  
 Non-Game Fish - on case-by-case basis.

Vermont:

Class A - (PWS) - As naturally occurs.

Class B and C (levels of rec. and F&WL) - temperature by "water type."

Type I (natural trout) - 1°F max. rise.

Type II (trout) - 1°F max. rise.

Type III (warmwater fish):

Max. River Temp.	Max. Rise
Above 66°F	1°
63-66°F	2°
59-62°F	3°
55-58°F	4°
Below 55°F	5°

Vermont (Cont'd) Type IV(trout lakes) - 1° max. rise. No withdrawal from or discharge to hypolimnion except withdrawals from PWS or water quality enhancement.

Type V(other lakes)

Max. Lake Temp.	Max. Rise
Above 60°F	1°
60-50°F	2°
Below 50°F	3°

Provision for hypolimnion as Type IV.

Virginia:

MAJOR CLASS	OR OTHER DESCRIPTION OF WATERS	RISE ABOVE NATURAL*	°F MAXIMUM	HOURLY CHANGE
I	Open Ocean (Seaside of the Land Mass)	4.0(Sept.-May) 1.5(June-Aug.)	-	2
II	Estuarine Tidal Water - Coastal Zone to Fall Line)	4.0(Sept.-May) 1.5(June-Aug.)	-	2
III	Free Flowing Streams (Coastal Zone and Piedmont Zone to the Crest of the Mountains)	5	90	2
IV	Mountainous Zone	5	87	2
V	Put and Take Trout Waters	5***	70	2
VI	Natural Trout Waters	5***	68	2

\* Natural temperature is that temperature of a body of water due solely to natural conditions without the influence of any point-source discharges.

\*\* The maximum hourly temperature change of 2°F is to apply beyond the boundaries of mixing zones and does not apply to temperatures caused by natural conditions.

\*\*\* Any rise above natural temperature to be allowed by the Board shall be determined on a case-by-case basis, but in no instance shall exceed 5°F.

Virgin Islands: Thermal policy

(a) Fish and other aquatic life shall be protected from thermal blocks by providing for a minimum 75 percent stream or estuarine cross-section and/or volumetric passageway, including a minimum of one half of the surface as measured from water edge to water edge at any stage of tide.

(b) In non-passageway the surface water temperature shall not exceed 90°F.

(c) No heat may be added except in designated mixing zones which would cause temperatures to exceed 90°F, or which would cause the monthly mean of the maximum daily temperature at any site, prior to the addition of any heat, to be exceeded by more than 1.5°F.

(d) No discharge or combination of discharges shall be injurious to fish or shellfish or the culture or propagation of a balanced indigenous population thereof.

(e) Rate of temperature change outside the maxing zone shall not be more than 1°F per hour nor to exceed 5°F in any 24-hour period except when natural phenomena cause these limits to be exceeded.

(f) Unless specific conditions such as spawning ground, migratory routes, or other sections of conditions from these regulations are applicable, the maxing zone should be defined by a sphere with a specified point as the center (not necessarily the outfall but limited to one point for each installation) and a radius equal to the square root of the volume of discharge (A) expressed as millions of gallons per day, times 200 feet (radius of mixing zone), and in no case exceed 3/4 mile.

Washington: Class AA (Extraordinary)

Water temperatures shall not exceed 16.0° Celsius (freshwater) or 13.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed  $t = 23/(T+5)$  (freshwater) or  $t = 8/(T-4)$  (marine water).

When natural conditions exceed 16.0° Celsius (freshwater) and 13.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

Washington(Cont'd)

For purposes hereof, "t" represents the permissive temperature change across the dilution zone, and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8° Celsius, and the maximum water temperature shall not exceed 16.3° Celsius (freshwater).

Class A (Excellent)

Water temperatures shall not exceed 18.0° Celsius (freshwater) or 16.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed  $t = 28/(T + 7)$  (freshwater) or  $t = 12/(T - 2)$  (marine water).

When natural conditions exceed 18.0° Celsius (freshwater) and 16.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

For purposes hereof, "t" represents the permissive temperature change across the dilution zone, and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8° Celsius, and the maximum water temperature shall not exceed 18.3° Celsius (freshwater).

Class B (Good)

Temperature - water temperatures shall not exceed 21.0° Celsius (freshwater) or 19.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed  $t = 34/(T+9)$  (freshwater) or  $t = 16/T$  (marine water).

When natural conditions exceed 21.0° Celsius (freshwater) and 19.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

## Washington(Cont'd)

For purposes hereof, "t" represents the permissive temperature change across the dilution zone, and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8° Celsius, and the maximum water temperature shall not exceed 21.3° Celsius (freshwater).

### Class C (Fair)

Temperature - water temperatures shall not exceed 24.0° Celsius (freshwater) or 22.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed  $t = 39/(T+11)$  (freshwater) or  $t = 20/(T+2)$  (marine water).

When natural conditions exceed 24.0° Celsius (freshwater) and 22.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

For purposes hereof, "t" represents the permissive temperature change across the dilution zone; and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

### Lake Class

No measurable change from natural conditions.

## Wisconsin

### Temperature Standards for Fish and Aquatic Life

1. There shall be no temperature changes that may adversely affect aquatic life.
2. Natural daily and seasonal temperature fluctuations shall be maintained.
3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5°F for streams and 3°F for lakes.
4. The temperature shall not exceed 89°F for warm water fish.

Streams classified as trout waters by the Department of Natural Resources (Wisconsin Trout Streams. Publication 213-720) shall not be altered from natural background by effluents that influence the stream environment to such an extent that trout populations are adversely affected.

Wisconsin (Cont'd)

There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

Lake Michigan and Lake Superior thermal standards. For Lake Michigan and Lake Superior the following thermal standards are established so as to minimize effects on the aquatic biota in the receiving waters.

(1)(a) Thermal discharges shall not raise the receiving water temperature more than 3°F above the existing natural temperature at the boundary of mixing zones established in paragraphs (b) and (c).

(b) 1. The mixing zone for a shoreline thermal discharges shall be the area included within the perimeter of a rectangular figure extending 1,250 feet in both directions along the shoreline from the outfall and 1,250 feet into the lake.

2. The mixing zone for an offshore thermal discharge shall be the area within a 1,000 foot radius circle with its center at the point of discharge.

(c) The department may, upon request from the owner of a source of thermal discharge, adjust the boundaries of the mixing zone established in paragraph (b) for that source. In no case may any mixing zone so established include an area greater than 72 acres nor may it include more than 2,800 feet of shoreline.

(2) In addition to the limitation set forth in subsection (1), but excepting the Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River, thermal discharges to Lake Michigan shall not raise the temperature of the receiving waters at the boundary of the established mixing zone above the following limits.

January	45°F	May	60°F
February	45°	June	70°
March	45°	July	80°
April	55°	August	80°
September	80°	November	60°
October	65°	December	50°

Wisconsin (Con'd)

Mississippi river thermal standards. In addition to the standards for fish and aquatic life, the monthly average of the maximum daily temperature in the Mississippi River outside the mixing zone shall not exceed the following limits:

January	40°F	July	84°
February	40°	August	84°
March	54°	September	82°
April	65°	October	73°
May	75°	November	58°
June	84°	December	48°

Review of thermal standards. (1) Whenever the owner of any source of thermal discharges that existed on or before July 31, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements, of this chapter provided this exemption will not endanger the propagation of such a population.

(2) Any owner desiring a review pursuant to NR 102.07 (1) shall submit a demonstration to the department no later than June 30, 1976. The department shall reach a decision no later than December 31, 1976.

(3) In the event the owner fails to make a satisfactory demonstration pursuant to NR 102.07(1), the department shall establish as compliance date for the thermal component to be achieved no later than July 1, 1979.

(4) Whenever the owner of any source of thermal discharges that commenced on or after August 1, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:



Wisconsin (Cont'd)

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(5) In the event an owner fails to make a satisfactory demonstration pursuant of NR 102.07 (4), the discharge shall be in compliance with the thermal requirements of this chapter upon commencement of the discharge.

(6) The department may require the reduction of thermal discharges or the size and configuration of a mixing zone if it finds that environmental damage is imminent or existent.

West Virginia

Temperature rise shall be limited to no more than 5°F above natural temperature, not to exceed 87°F at any time during months of May through November and not to exceed 73°F at any time during months of December through April.

Wyoming

a. For Class I, II and III water effluent attributable to or influenced by the activities of man shall not be discharged in amounts which change natural ambient water temperatures to levels which are deemed to be harmful to existing aquatic life.

b. For impoundments and waters designated by the Wyoming Game and Fish Department as cold water fisheries effluent attributable to or influenced by the activities of man shall not be discharged in amounts which will result in a change of more than 2 degrees F (1.1 degree C) in existing temperatures.

c. For waters designated by the Wyoming Game and Fish Department as warm water fisheries effluent attributable to or influenced by the activities of man shall not be discharged in amounts which will result in a change of more than 4 degrees F (2.2 degrees C) in existing temperatures.

d. The maximum allowable stream temperatures will be the maximum daily stream temperatures plus the allowable change, provided that this temperature is not lethal to existing fish life, which is considered to be 78 degrees F (25.6 degrees C) in the case of cold water fisheries and 90 degrees F (32.2 degrees C) in the case of warm water fisheries.

- Wyoming (Cont'd) e. With the exception of the provisions of Section 10d and 12 of these regulations, temperature standards shall apply at all times and at all depths of the receiving water and may not be violated at any time or at any depth.
- f. In all waters supporting warm and/or cold water fish there shall be no induced temperature change over spawning beds. For questions concerning the location of spawning beds the Wyoming Game and Fish Department shall be the final authority.
- g. The various requirements of this Section may be waived only under the provisions of Section 316(a) of the Federal Act.
- American Samoa The temperature shall not deviate more than 1.5°F from conditions which would occur naturally and shall not hourly fluctuate more than 1.0 degrees Fahrenheit nor exceed 85 degrees Fahrenheit due to the influence of other than natural causes.
- Trust Territories Public or Domestic Water Supply - temperature from other than natural causes shall not exceed 85°F, and there shall not be more than 5°F increase nor more than a 1.0°F hourly temperature variation due to thermal discharges or reservoir manipulation.
- Recreation - shall not exceed 85°F due to influence of other than natural conditions.
- Propagation of Fish and other Aquatic Life - shall not deviate from natural conditions by more than 1.5°F, nor hourly deviate by more than 1.0°F.

**U.S. Environmental Protection Agency**  
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