ENVIRONMENTAL PROTECTION AGENCY

[FRL–6513–6]

Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of availability.

SUMMARY: Pursuant to Section 304(a)(1) of the Clean Water Act (CWA), the Environmental Protection Agency (EPA) announces the publication and availability of the *1999 Update of Ambient Water Quality Criteria for Ammonia* (1999 Update), containing EPA's recommended ammonia criteria for the protection of freshwater aquatic life. These criteria are EPA's recommendations for States, Territories, and authorized Tribes to use as guidance in adopting water quality standards. Water quality standards form the basis for establishing enforceable, water quality-based effluent limitations in CWA permits. These criteria constitute the Agency's current recommended Section 304(a) criteria for ammonia, and will continue to serve as such until EPA publishes a revision. In August 1998, EPA published the *1998 Update of Ambient Water Criteria for Ammonia* and asked for public comment. The 1999 Update published today incorporates revisions made in response to comment on the 1998 Update, and supercedes all previous freshwater ammonia criteria.

ADDRESSES: ''Obtaining the Document.'' A copy of the document, 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA–822–R–99–014) may be obtained from the U. S. Environmental Protection Agency, by contacting: National Service Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, Ohio, USA 45242–2419, Phone: 1–800/490–9198; International: 1/513–489–8190, E-mail: ncepi.mail@epamail.epa.gov.

The document, and a fact sheet that provides an overview of the criteria document, may be viewed on the Internet at http://www.epa.gov/ost/standards/amonsub.html.

''Examining the Administrative Record.'' The Administrative Record supporting EPA's recommended ammonia criteria for the protection of freshwater aquatic life is available under docket number W–98–20 at the Water Docket, Room EB–57, Environmental Protection Agency, 401 M Street SW, Washington, DC 20460 on Monday through Friday, excluding Federal holidays, between 9:00 a.m. and 4:00 p.m. For access to docket materials call (202) 260–3027 for an appointment. The record contains material that EPA relied on to support the recommended criteria contained in the 1999 update. A reasonable fee will be charged for photocopies.

FOR FURTHER INFORMATION CONTACT: Brian Thompson, Standards and Applied Science Division (4305), U.S. EPA, Office of Science and Technology, 401 M. Street, S.W., Washington, D.C. 20460; (202) 260–3809; *thompson.brian@epamail.epa.gov.*

SUPPLEMENTARY INFORMATION:

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I. Background on Criteria Program

Section 304(a)(1) of the Clean Water Act (33 U.S.C. 1314(a)(1)) directs EPA to publish and periodically update ambient water quality criteria. These criteria are to reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation. These criteria serve as guidance to States, Territories, and authorized Tribes in adopting water quality standards under Section 303(c) of the CWA that protect aquatic life from acute and chronic effects of ammonia. Water quality standards provide a basis for controlling discharges or releases of pollutants. Under the CWA, States and Tribes are to establish water quality criteria to protect designated uses. State and tribal decision makers retain the discretion to adopt water quality criteria on a case-by-case basis that differ from this guidance when appropriate and where supported by local data. In this notice EPA is announcing the publication and availability of the Agency's most recent calculation of water quality criteria for freshwater ammonia.

Ambient water quality criteria developed under Section 304(a) are based on data and scientific judgments on the relationship between pollutant concentrations and effects on aquatic life, human health, and the environment. Section 304(a) criteria do not reflect consideration of economic impacts or the technological feasibility of meeting the chemical concentrations in ambient water.

II. Background on Development of the Ammonia Criteria Document

In 1985, EPA published Ambient Water Quality Criteria for Ammonia—1984, which contained criteria concentrations for protection of freshwater aquatic life. The Criterion Maximum Concentration or CMC, which applied to short (acute) exposure, and the Criterion Continuous Concentration or CCC, which applied to longer (chronic) exposure, varied primarily with pH and the type of fishery involved. On July 30, 1992, EPA revised its recommended value for the CCC through a memorandum ''Revised Tables for * * * Freshwater Ammonia Concentrations.''

In late 1996 EPA undertook a review and revision of the CCC for ammonia, in response to public interest in the criterion. As part of this process, EPA undertook peer review of a draft criterion (June 5, 1997). The results of this peer review are included in Peer Review Report for EPA's Addendum to Ambient Water Quality Criteria Document for Ammonia, dated October 9, 1997. On August 18, 1998, EPA published the *1998 Update of Ambient Water Quality Criteria for Ammonia* and solicited public comment. Today, EPA is publishing the *1999 Update of Ambient Water Quality Criteria for Ammonia,* which incorporates changes made in response to public comment on the 1998 Update. The ammonia criteria published today supersede all previous freshwater aquatic life ammonia criteria.

The water quality criteria in the 1999 Update pertain only to fresh waters. They do not change or supersede the EPA criterion for ammonia in salt water, published in *Ambient Water Quality Criteria for Ammonia (Saltwater)—1989.*

EPA aquatic life criteria consist of acute and chronic criteria concentrations, applicable averaging periods (i.e., the duration used in comparing ambient water concentration to water quality criteria), and allowable excursion frequencies. The criteria published today are based on a revised temperature dependency of the CCC (chronic criterion), and modification of the 4-day criterion provision from 2.0 to 2.5 times the CCC. As a result, the acute criterion for ammonia remains dependent on pH and fish species (i.e., salmonids versus non-salmonids), and the chronic criterion for ammonia is now dependent on pH and temperature. In addition, at lower temperatures the chronic criterion is also dependent on

the presence or absence of early life stages of fish.

III. Response to Comments on 1998 Update

EPA considered all comments submitted on the 1998 Update. Responses to comments are contained in the document *Response to Comment on the 1998 Update of Ambient Water Quality Criteria for Ammonia.* The two most significant issues raised in the comments were the pH relationship and the temperature relationship used for the chronic criterion (CCC); that is, how the CCC changes as a function of pH and as a function of temperature.

A. Ammonia pH Relationship

In the 1998 Update, the pH relationship of the CCC was different than the pH relationship of the CMC. Notably, in the pH range from 8.0 to 6.5, the CCC increased less quickly with decreases in pH than did the CMC. Some commentors expressed concern that because so much more data are available to derive the acute relationship than the chronic relationship, it would be better to apply the acute relationship to the chronic criterion.

EPA does not agree that the chronic pH relationship should be the same as that of the acute pH. The data for smallmouth bass and for daphnia unequivocally demonstrate that the acute-chronic ratio changes with pH, and therefore that the chronic relationship should not be the same as the acute relationship. While there may be alternative ways of accounting for this difference, EPA believes that the approach it has taken, to derive the chronic relationship directly from the available chronic data for smallmouth bass and daphnia, is scientifically appropriate and reasonable. Thus, for the 1999 Update, EPA has not changed the chronic pH relationship.

B. Ammonia Temperature Relationship

In the derivation of the 1998 Update, the data used by EPA indicated that the sensitivity of fish does not change significantly with temperature, either for acute or chronic exposure. However, some commentors expressed concern that the 1998 chronic criterion would change with temperature if invertebrates are considered.

In response to these comments, EPA re-examined the available data for invertebrates, which were from a study by Arthur et al. (1987), as referenced in the 1998 and 1999 Updates. The Arthur et al. data suggested a temperature relationship for invertebrates but not for fish. In the 1998 Update, EPA did not use the Arthur et al. data because the authors were concerned that other variable factors in their tests might have had a potential to confound their results. In re-examining their data in response to comments, however, EPA found that the *fish* data from Arthur et al. showed behavior quite similar to that from numerous other investigators, that is, little relationship with temperature. Consequently, EPA concluded that the *potential* confounding factors were *unlikely* to have much effect on the results, and that the Arthur et al. (1987) results could be used to define a temperature relationship for invertebrates.

In contrast to the fish data, the invertebrate data from Arthur et al. (1987) show a significant and consistent relationship of increasing lethal concentration (decreasing toxicity) with decreasing temperature. Because the two most sensitive species in the chronic data set are invertebrates, a temperature dependency for the effect concentrations for these species results in an overall temperature dependency for the ammonia chronic criterion. Therefore, EPA's 1999 Update contains a temperature dependent chronic criterion for ammonia. This temperature dependency does not affect the acute criterion, because none of the acutely sensitive species in the acute data set are invertebrates.

IV. Summary of the 1999 Ammonia Criterion

In natural waters ammonia exists in two forms, un-ionized NH_3, and ionized NH^{+4}, with equilibrium controlled by temperature and pH. Whereas the 1984/1985 criteria were derived based on un-ionized ammonia, which required a relationship with temperature, the criteria published today are expressed only as total (un-ionized plus ionized) ammonia.

Based on differences in species acute sensitivity, different CMC values were derived for waters where salmonids (e.g., trout and salmon) are present and waters where salmonids are not present. Such distinctions in species *chronic* sensitivity were not apparent, however. Consequently the CCC does not vary with the type of fish present.

The acute criterion or CMC is unchanged from 1998. The values vary as a continuous function of pH and are not dependent on temperature. For example, as seen in Table 1 below, at pH=7 the values are 24.1 mg N/L for salmonid fish (trout and salmon) present, and 36.1 mg N/L for salmonids absent. Whereas at pH=8 the values are 5.62 mg N/L for salmonids present, and 8.40 mg N/L for salmonids absent.

TABLE 1.—AMMONIA CMC VALUES BASED PH AND FISH SPECIES

pH	CMC mg N/L	
	Salmonids present	Salmonids absent
7	24.1	36.1
8	5.62	8.40

The chronic criterion or CCC varies as continuous functions of temperature and pH. At lower temperatures, the values also depend on whether early life stages of fish are present or absent. To illustrate its general behavior, the table below (Table 2) shows example values of the CCC under a few different temperature and pH conditions.

TABLE 2.—AMMONIA CCC VALUES BASED ON TEMPERATURE, PH, AND EARLY LIFE STAGES OF FISH

Temperature	CCC mg N/L			
	Early life stages of fish present		Early life stages of fish absent	
	pH=7	pH=8	pH=7	pH=8
0° C	5.91	2.43	9.60	3.95
10° C	5.91	2.43	7.91	3.26
20° C	4.15	1.71	4.15	1.71
30° C	2.18	0.897	2.18	0.897

V. Implementation of the Final 1999 Ammonia Criteria

A. Design Flow and Averaging Period

The use of aquatic life criteria for developing water quality based permit limits and for designing waste treatment facilities requires the selection of an appropriate waste load allocation model. Dynamic models are preferred for the application of aquatic life criteria in order to make best use of the specified concentrations, durations, and frequencies. If dynamic models cannot be used, then an alternative is steady-state modeling. Because steady-state modeling is based on various simplifying assumptions, it is less complex, and might be less realistic, than dynamic modeling. However, since steady-state models are easier to apply, they are used more often than dynamic models.

An important step in the application of steady-state modeling to streams is calculating the design flow. States and Tribes can refer to Appendix D of the *Technical Support Document for Water Quality-based Toxics Control* (TSD) for EPA's recommended design flow, as well as EPA's basis for its design flow recommendations.

In the TSD, for aquatic life, EPA recommends design flows for both the criterion maximum concentration (CMC, *or* acute criterion) and the criterion continuous concentration (CCC, *or* chronic criterion). For the CMC, EPA recommends the 1B3 (the lowest one-day flow based on a three-year return interval when flow records are analyzed using EPA's 1986 DFLOW procedure) or the 1Q10 (the lowest one-day flow based on a ten-year return interval when flow records are analyzed using extreme-value statistics). For the CCC, EPA recommends the 4B3 (the lowest four-day flow based on a three-year return interval when flow records are analyzed using EPA's 1986 DFLOW procedure) or the 7Q10 (the lowest seven-day flow based on a ten-year return interval when flow records are analyzed using extreme-value statistics).

For ammonia, EPA continues to recommend the 1B3 or the 1Q10 as the design flow for the CMC. Even though EPA's recommended design flow for the CCC, as stated in the TSD, is based on a 4-day average, EPA's design flow guidance can be applied to the 30-day averaging period of ammonia. Therefore, for the CCC for ammonia, EPA recommends the 30B3 for the design flow, if flow records are analyzed using EPA's 1986 DFLOW procedure. In addition, EPA believes that the 30Q10 and the 30Q5 are at least as protective as the 30B3. Therefore, if flow records are analyzed using extreme-value statistics, EPA also recommends the 30Q10 or the 30Q5 as the design flow for the CCC for ammonia. As explained in the 1999 Update, within this 30-day period, no 4-day average concentration should exceed 2.5 times the CCC. Consequently, the design flow should also be protective of any 4-day average at 2.5 times the CCC. EPA believes that in the vast majority of cases, the 30Q10 is protective of both the CCC (which, for ammonia, is associated with a 30-day average) and any 4-day average at 2.5 times the CCC. If the ammonia CCC is implemented using the 30Q10, no further conditions are necessary. However, if a State or Tribe specifies the use of the 30Q5, then the State or Tribe should demonstrate that a 7Q10 (the lowest average 7-day once-in-ten-year flow using extreme-value statistics) is protective of 2.5 times the CCC, to ensure that any short term (4-day) flow variability within the 30-day averaging period does not lead to shorter-term chronic toxicity. Since the 7Q10 approximates the 4B3 (the lowest average 4-day once-in-three year flow using EPA's 1986 DFLOW procedure), EPA recommends the 7Q10 be used to evaluate if any 4-day average within the 30-day averaging period will exceed 2.5 times the CCC. The comparison of the 30Q5 at one times the CCC to the 7Q10 at 2.5 times the CCC is stream-specific; a State or Tribe utilizing this approach should adopt both the 30Q5 at one times the CCC and the 7Q10 at 2.5 times the CCC into its standards and specify that the more stringent be used.

In adopting a freshwater aquatic life CCC for ammonia, based on the 30-day averaging period recommended in the 1999 Update, the procedures for calculating NPDES permit limits should be modified from those described in the TSD. The equations (and corresponding ''multiplier tables'') presented in the TSD assume a 4-day averaging period and are summarized below:

The acute long term average (LTA_a) is determined from the acute wasteload allocation (WLA_a) using the equation:

$$LTA_a = WLA_a e^{[0.5\sigma^2 - z\sigma]}$$
$$\text{where } \sigma^2 = \ln\ (CV^2 + 1)$$

The chronic long term average (LTA_c) is determined from the chronic wasteload allocation (WLA_c) using the equation:

$$LTA_c = WLA_c e^{[0.5\sigma_4^2 - z\sigma_4]}$$
$$\text{where } \sigma_4^2 = \ln\ (CV^2/4 + 1)$$

A comparison of the LTA_a and LTA_c is then performed and the minimum value is selected (LTA_{MIN}). The maximum daily limit (MDL) is then calculated from the LTA_{MIN} using the equation:

$$MDL = LTA_{MIN} e^{[z\sigma\ -0.5\sigma^2]}$$
$$\text{where } \sigma^2 = \ln\ (CV^2 + 1)$$

The average monthly limit (AML) is calculated from the LTA_{MIN} using the equation:

$$AML = LTA_{MIN} e^{[z\sigma_n - 0.5\sigma_n^2]}$$
$$\text{where } \sigma_n^2 = \ln\ (CV^2/n + 1)$$

The value of ''n'' in the calculation of the AML is based on an assumed monthly effluent monitoring frequency for the permittee. In general, the ''n'' value should be set equal to the actual monitoring frequency that will be required of the permittee. However, if the AML is based on the LTA_c (i.e., $LTA_{MIN} = LTA_c$), the TSD recommends that the value of ''n'' be set no lower than 4 (corresponding to the 4-day CCC) to ensure that the AML does not exceed the WLA_c.

Since the 1999 Update recommends a 30-day averaging period for deriving the CCC, the equation for determining the LTA_c should be modified as follows:

$$LTA_c = WLA_c e^{[0.5\sigma_{30}^2 - z\sigma_{30}]}$$
$$\text{where } \sigma_{30}^2 = \ln\ (CV^2/30 + 1)$$

The comparison of the LTA_a and LTA_c is then performed in the same manner and the MDL and AML are calculated from the LTA_{MIN}.

Consistent with the guidance regarding the calculation of an AML using a 4-day CCC, the value of ''n'' (assumed monitoring frequency) used in the AML calculation should not be less than the averaging period upon which the criterion value is based. For a more detailed discussion of the selection of an appropriate value for ''n'' in limit development, refer to Section 5.5.3 of the TSD.

B. Early Life Stage Absent (ELS-Absent) Provision

EPA is establishing a provision in its ammonia criteria that allows for a relaxation of the CCC when early life stages (ELS) of fish are not present, since, at low ambient water temperatures, adult and juvenile fish are less sensitive to ammonia toxicity than are early life stages of fish. EPA has concluded that it would be appropriate to relax the ammonia CCC, as ambient water temperature decreases, in waterbodies where early life stages are not present. This provision, based on ELS absent, applies only to the recommended aquatic life chronic criterion for ammonia, and any new or

revised water quality standard incorporating such a provision is subject to review and approval by EPA.

The 1999 Update constitutes EPA's scientific recommendations regarding ambient concentrations of ammonia that protect freshwater aquatic life. EPA will review, and approve and disapprove, State and Tribal water quality standards for ammonia, pursuant to section 303(c) of the CWA and the implementing regulations at 40 CFR 131.

EPA has identified the following list of issues regarding the implementation of the ELS-absent provision. These issues have been raised to EPA since the August 1998 update. EPA is posing the issues in a question and answer format to provide clarification on implementing the ELS-absent provision. In the event that States, territories, and authorized Tribes need further clarification on implementing the ELS-absent provision, they should consult with their local EPA Regional office.

1. What is the early life stage-absent (ELS-absent) provision?

Under specific conditions, States and Tribes may adjust their water quality standards to reflect the decrease in ammonia toxicity to adult and juvenile fish as water temperature decreases. Because ammonia toxicity to early life stages of fish does not appear to decrease as water temperature decreases, the ELS-absent provision is not allowed at times of the year when early life stages are present. *This ELS-absent provision applies only to the aquatic life chronic criterion for ammonia*, and the adoption of this provision, as is the case for any new or revised standard, is subject to approval by EPA.

The magnitude of the ELS-absent adjustment is dependent on temperature, and can be found in EPA's 1999 Update of Ambient Water Qaulity Criteria (1999 Update). In the 1999 Update, the ammonia chronic criterion is presented in two separate tables, one for periods when fish early life stages are present and one for periods when fish early life stages are absent. Therefore, when early life stages of fish are present, States and Tribes should use the ELS-present table, and when early life stages of fish are absent, States and Tribes may use the ELS-absent table.

2. How does EPA envision States and Tribes implementing the ELS-absent provision?

States and Tribes should clearly identify in their water quality standards the applicable ammonia criteria for all State or Tribal surface waters for all times of the year. The approach a State or Tribe may choose will differ depending on how its water quality program is structured.

Some factors to consider in implementing the ELS-absent provision are the resources available for State and Tribal Agencies to administer site-specific risk management decisions; the variety of watersheds and eco-regions within a State or Tribe; the diversity of fisheries within the State or Tribe; and the geographic location of the State or Tribe. For example, a State or Tribe in the Pacific Northwest may choose not to modify criteria for ammonia at all, based on the absence of early life stages of fish, because the State or Tribe is dominated by salmonid fisheries with different species spawning throughout the year. Another State or Tribe may choose to make ELS-absent adjustments to the ammonia criteria site-specifically, when data or information is provided which justifies a different, more appropriate ammonia criterion. Many States and Tribes already have provisions in their water quality standards which authorize site-specific criteria modifications when new information becomes available. States and Tribes that have invested resources in mapping the distribution of different species within the State or Tribe may choose to determine which waterbodies warrant the ELS-absent provision and adopt seasonal ammonia criteria just for those waters as appropriate.

EPA believes that tailoring the ammonia criteria to different classes of waterbodies would be the most efficient means of administering the ammonia criteria ELS-absent provision. State and Tribal programs with refined, biologically-based designated use classification systems are best structured for this approach. Refining the designated use to reflect the presence or absence of sensitive life stages may involve an upfront investment of resources but in the long term, EPA believes it significantly reduces the administrative burden of having to repeatedly revise the standards site-specifically. Refined, biologically-based use classification systems enable States and Tribes to efficiently tailor numerous criteria to waterbodies with shared characteristics. Refined, biologically-based use classification systems also more clearly communicate the intended water quality goals of a waterbody to the public.

Any approach a State or Tribe chooses to implement the ammonia criteria must be reflected in the State's or Tribe's water quality standards and submitted to EPA for review and approval. In order for EPA to determine the scientific defensibility of a State's or Tribe's approach as part of the Clean Water Act section 303(c) review and approval/disapproval process, EPA would want to review information concerning the geographic areas and the times of the year the ELS-absent provision applies, and would want the State or Tribe to provide all of the data and information the State or Tribe relied on for its rationale.

3. Is the ELS-absent provision considered a site-specific criterion or could a State or Tribe establish an eco-regional ELS-absent provision? Could a State adopt an ELS-absent provision state wide? If a State or Tribe uses an eco-region approach, what factors should it consider in determining the ELS-absent provision for its waterbodies?

The ELS-absent provision could be done on either a site-specific basis, or it may be more efficient to provide the adjustment on a watershed or eco-regional basis if sufficient information and data exist. If a State or Reservation is sufficiently small or homogenous, it could apply the same provision on the same schedule state or reservation-wide.

When establishing an ELS-absent provision on an eco-region basis, the objective should be that waters within each eco-region have similar periods when there is an absence of early life stages of fish. There are a number of factors that a State or Tribe could use to define its eco-regions. For example, if the spawning period of a given species of fish and the ambient water temperature vary with latitude, then a State or Tribe could use latitude to define its eco-regions. Other factors that a State or Tribe could use to define its eco-regions include watershed, elevation, and stream order. For smaller States or Reservations, geographic variations are likely to be less extreme, and will have a smaller effect on ambient water temperature and spawning periods. As the size of a State or Reservation increases, it becomes increasingly important to consider the effects of geographic variation on ambient water temperature and spawning periods, and it becomes more difficult to generalize about the level of protection afforded to the aquatic communities. The larger the area of consideration for the ELS-absent provision, the greater is the need for data or conservatism in its application.

4. Which stages of fish development are included in the term ''early life stages?'

The early life stages include the pre-hatch embryonic period, the post-hatch free embryo or yolk-sac fry, and the

larval period, during which the organism feeds. Juvenile fish, which are anatomically rather similar to adults, are not considered an early life stage.

The duration of the early life stages extends from the beginning of spawning through the end of the early life stages. Since the duration of early life stages can vary according to fish species, EPA recommends that any ELS-absent provision reflect such variations. A good source for determining the duration of early life stages is *The American Society for Testing and Materials (ASTM) Standard E–1241,* ''Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fishes'', which uses the following durations when testing for toxicity on early life stages (Table 3).

TABLE 3.—DURATION OF EARLY LIFE STAGE DEVELOPMENT OF SELECTED FISH SPECIES

Taxon	End of early life stage development
Fathead minnow	34 days after spawning.
Channel catfish	34 days after spawning.
Bluegill	34 days after spawning.
White Sucker	34 days after spawning.
Northern pike	34 days after spawning.
Striped bass	46 days after spawning.
Trout, salmon, char	30 days after swim-up (swim-up is the stage when fry leave the nest and swim up to the surface to catch food).

For taxa not listed above, the period for early life stage development should be based on taxonomic and life history similarity.

5. To allow the ELS-absent provision, should there be a complete absence of sensitive life stages or is the presence of very low densities acceptable, as long as there is no threat to the overall population? What should a State's or Tribe's determination of absence of fish sensitive life stages consist of? Is actual biological survey data required, or can a finding be based on expert opinion from fisheries biologists? Is EPA going to specify any minimum biological data requirements?

To be most protective of aquatic life in a waterbody being considered for the ELS-absent provision, knowing that there is a ''complete absence'', or ''very low densities'' of sensitive life stages of fish, would provide a high level of confidence in allowing for the adjustment. However, actually measuring the ''complete absence'' of sensitive life stages of fish in a waterbody may be very difficult, if not impossible, even with rigorous, scientifically designed sampling efforts. Most field sampling methods are not designed to sample for these sensitive life stages. In addition, ''very low densities'' are difficult to accurately measure without extensive fish population sampling at critical times of the year. Further, because the conditions for implementing an ELS-absent provision apply to all fish species rather than to only game fish species, there may be less field data readily available for all fish species comprising the aquatic community at any given site. Therefore, the objective should be to best identify the timeframes during the year when sensitive life stages are most likely not to be present in numbers that, if chronic toxicity did occur, would affect the long-term success of the fish population.

To best determine when the ELS-absent provision should be applied, all readily available information regarding the fish species distributions, spawning periods, nursery periods and the duration of sensitive life stages found in the waterbody should be considered. Information on waterbody temperature might also be useful. Expert opinions from fisheries biologists and other scientists should be considered, and where it can be obtained, the consensus opinion from a diverse body of experts may be heavily relied upon.

The determination of the timeframe during the year when sensitive life stages are most likely not to be present in numbers that, if chronic toxicity did occur, would affect the long-term success of the fish populations, should include a record of information adequate to withstand public scrutiny. EPA will use this record as the basis upon which to approve or disapprove the standard. The record should clearly explain all the factors and information considered in arriving at the determination. EPA does not have minimum data requirements for these determinations; however, States and Tribes should rely on the preponderance of available information. Without adequate and reliable information, EPA would make the judgment that sensitive life stages are present and must be protected at all times of the year.

6. Is the evaluation of the presence or absence of early life stages of fish limited to what exists in a water body currently, or should historical data on aquatic communities be considered?

According to the Clean Water Act, States and Tribes are to protect existing uses, and therefore should protect for the most sensitive uses that have occurred in a given waterbody since November, 1975. 40 CFR 131.12(a)(1) and 40 CFR 131.3(e). Hence, States and Tribes should consider both current and historical species that have used a waterbody for spawning and rearing since November, 1975. Even where water quality is protective of designated uses, the current species composition in a waterbody may not reflect all species that have used the waterbody for spawning or rearing since 1975. It is EPA's position that any ELS-absent provision should not prevent the return of any species associated with an existing or designated use. Therefore, States and Tribes should evaluate both current and historical data back to November, 1975, in determining a presence or absence of sensitive life stages.

7. In specifying in its water quality standards when the ELS-absent provision applies, can a State or Tribe rely on the same date every year based on average annual ambient water temperatures, or should a State or Tribe rely on ambient water temperature thresholds that would trigger the ELS-absent provision?

EPA believes that the best way for a State or Tribe to implement its ELS-absent provision is to establish in its water quality standards a fall and a spring date based on historical spawning and early life stage data. Alternatively, a State or Tribe may

specify ambient water temperature thresholds that would serve as surrogates for expected spawning and expected absence of early life stages of fish. Upon reaching the temperature thresholds in the fall and spring, the ELS-absent provision would go into effect.

Either approach may be suitable, however, EPA recommends the establishment of a fall and spring date in a State's or Tribe's water quality standards, because such an approach is simpler to implement in NPDES (National Pollutant Discharge Elimination System) permits. Alternatively if a State or Tribe establishes an ambient water temperature threshold approach, it may specify the fall and spring temperature thresholds in its water quality standards. These thresholds would subsequently be implemented through water quality control measures (e.g., NPDES permitting, TMDLs). EPA, in its review and approval/disapproval of State and Tribal water quality standards, may request that States and Tribes submit detailed procedures addressing the implementation of this alternate approach. If the dates are decided at the time of permit issuance, then the ambient water temperature record (or other condition record) for the site would be evaluated (along with the pH and flow record) as part of the permit issuance process. The final NPDES permit would include fixed dates specifying the seasonally varying water quality-based effluent limit (WQBEL).

Regardless of the approach taken, States and Tribes should keep in mind the following concepts in determining the beginning and end of the ELS-absent period. In the spring, a State or Tribe should consider when (or at what ambient water temperature) early spring spawning is likely to occur, and set the spring cut-off date (or temperature threshold) accordingly. Setting a fall start date (or temperature threshold) is more complicated because in addition to considering when the late summer and early fall spawners are likely to stop spawning, a State or Tribe should also consider the duration of the early life stages of the late summer/early fall spawners. For instance, if the temperature threshold was triggered for the latest fall spawner on October 15, and its early life stage is expected to last 30 days, then the ELS-absent provision would begin as early as November 15. However, if in the same waterbody, the temperature threshold for spawning was triggered for an earlier spawner on October 1, and its early life stage lasted 60 days, then the ELS-absent provision could begin no earlier than December 1. Hence when using temperature thresholds a State or Tribe needs to consider both expected spawning, as well as the expected duration of early life stages of fish. Safety factors are also appropriate where a State or Tribe is less confident in its data for a particular site or where there might be late spawning populations.

8. Can a State or Tribe apply the ELS-absent provision to an underlying site-specific ammonia criterion?

Applying the ELS-absent provision to a site-specific criterion depends on the procedure used for determining the site-specific criterion. At sites where the Water-Effect Ratio (WER) procedure is used, the WER would apply to both ELS-absent and ELS-present criteria values. (However, it has been EPA's experience that the WER procedure has yielded ratios close to 1.0 for ammonia.) At sites where the Recalculation or Resident Species procedure is used, a State or Tribe should consider the effects of having eliminated species from the data set before applying the ELS-absent provision. In many instances, site-specific criteria are developed for small tributary streams and headwater streams with lower species diversity and fewer game fish species. States and Tribes considering the ELS-absent provision must protect early life stages of all fish species, not just species considered to be of value to a fishery. Because the Recalculation Procedure involves a re-derivation of the criterion, and not merely a factor adjustment of the criterion, a re-derivation of a ELS-absent criteria table should follow procedures similar to those used in the 1999 Update.

C. State and Tribal Adoption of Ammonia Criteria

EPA recommends that States and Tribes adopt numeric ammonia criteria applicable at all times of the year for all waters designated for the protection of aquatic life or for waters whose existing uses include aquatic life. Numeric criteria may be adopted based on EPA's ambient water quality criteria for ammonia, such criteria modified to reflect site-specific conditions, or other scientifically defensible methods. 40 CFR 131.11(b)(1). States and Tribes should adopt narrative criteria where numeric criteria cannot be established or to supplement numeric criteria. 40 CFR 131.11(b)(2). Because EPA has issued section 304(a) criteria for ammonia, numeric criteria for ammonia can be established. Ammonia is a pollutant that is routinely found in the wastewater effluent of publicly-owned treatment works and landfill leachate, as well as run-off from agricultural fields where commercial fertilizers and animal manure are applied. Ammonia is frequently identified as a pollutant causing or contributing to water quality impairment when states assemble their lists of impaired surface waters under section 303(d). Because ammonia has known toxic effects to aquatic life, as is demonstrated in EPA's 1999 Update of Ambient Water Quality Criteria for Ammonia, the Office of Water finds that control of ammonia discharges is necessary to protect aquatic life uses of surface water across the United States. Numeric criteria for ammonia are much easier to implement in NPDES permits than are narrative criteria because they form a concrete basis for calculating the need for and the substance of any needed effluent limitations. In the TMDL program, such criteria serve as a definitive benchmark for determining impairment of waters for listing purposes and then as a concrete starting point for establishing TMDL's, wasteload allocations for point sources and load allocations for nonpoint sources. Further, because water quality criteria are commonly implemented through regulatory mechanisms such as TMDLs and NPDES permits, State and Tribal adoption of numeric criteria does not have a direct impact on any given discharger. In the case of NPDES permits, a water quality based effluent limit would apply to a given discharger only if the discharge has the reasonable potential to cause an exceedance of a water quality criterion. In addition under section 303(d) of the CWA, waterbodies would be listed and TMDLs established only where the ambient concentrations in the water exceed the ammonia criteria.

The adoption of numeric criteria for ammonia will be a priority for the triennial reviews of water quality standards that will occur in FY2001–2003. Beginning with FY2001, EPA Headquarters and Regional Offices will develop management agreements with the states and tribes that will include commitments to have states and tribes adopt numeric criteria for ammonia. Where a state does not amend its water quality standards to include water quality criteria for ammonia that will ensure protection of designated uses, EPA's Office of Water will recommend to the Administrator that she act under Section 303(c) of the Clean Water Act to promulgate numeric criteria with the goal of assuring that protective criteria for ammonia apply in all states not later than 2004.

VI. Threatened or Endangered Species

Because ambient criteria are generally designed to protect 95 percent of all fish and aquatic invertebrate taxa, there remains a small possibility that the criteria will not protect all listed endangered or threatened species. Consequently, EPA recommends that States and Tribes develop more stringent, site-specific modifications of the criteria as necessary to protect threatened and endangered species.

In adopting ammonia criteria for specific water bodies, States and Tribes may need to develop more stringent, site-specific modifications of the criteria to protect listed endangered or threatened species, where sufficient data exist indicating that endangered or threatened species are more sensitive to a pollutant than the species upon which the criteria are based. Such modifications may be accomplished using either of the following two procedures.

1. More stringent, site-specific modifications may be calculated to protect a listed endangered or threatened species by using the Species Mean *Acute* Value (SMAC) and Species Mean Chronic Value (SMCV). *Resetting the CMC:* If the CMC is greater than 0.5 times the Species Mean Acute Value for a listed threatened or endangered species, or a surrogate for such species, obtained from flow-through, measured-concentration tests, then the CMC should be reset equal to 0.5 times that Species Mean Acute Value. (The empirical factor 0.5 converts from a 50 percent lethality concentration to a minimal-lethality concentration.) *Resetting the CCC:* If the CCC is greater than the Species Mean Chronic Value of a listed threatened or endangered species or surrogate, then the CCC should be reset to that Species Mean Chronic Value. If the Species Mean Chronic Value is not available, then the CCC can be reset by dividing the Species Mean Acute Value by the Acute to Chronic Ratio (ACR) in accord with EPA's ''Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses (1985),'' for deriving a CCC for commercially and recreationally important species; or,

2. More stringent, site-specific modifications may be calculated to protect a listed endangered or threatened species by using the recalculation procedure for site-specific modifications described in Chapter 3 of the U.S. EPA Water Quality Standards Handbook, Second Edition—Revised (1994).

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