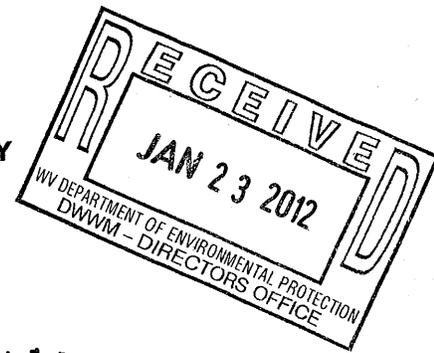




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029



JAN 13 2012

Mr. Scott G. Mandirola, Director
Water and Waste Management Division
West Virginia Department of Environmental Protection
Charleston, West Virginia 25304

Dear Mr. Mandirola,

On August 5, 2011, the U.S. Environmental Protection Agency (EPA) Region III received for review from West Virginia, revisions to West Virginia's Water Quality Regulations, effective June 27, 2011. On December 16, 2011, EPA listed the new and revised provisions and specified its determination with regard to each provision. It has been brought to my attention that the following revisions to West Virginia's Water Quality Regulations were inadvertently left out of EPA's decision rationale: (1) Appendix E, Table 1, West Virginia revised its chronic iron criterion for trout waters from 0.5 mg/L to 1.0mg/L; and (2) Appendix E, Table 1, Footnote 4, West Virginia added "organoleptic effects" to its Category A Public Water Supply criteria.

This letter notifies West Virginia of EPA's approval of the above two revised provisions. Based on a review of West Virginia's submission and supporting documentation, EPA finds that the new or revised provisions are consistent with the Clean Water Act and EPA's implementing regulation at 40 CFR Part 131. The two specific provisions EPA is approving and the rationale for the approval can be found in the amended rationale enclosed to this letter.

Under the Endangered Species Act, EPA has the obligation to determine if our approval of these modifications to West Virginia's Water Quality Standards regulation will adversely affect threatened and endangered species and their critical habitat in West Virginia. EPA's biological evaluation found no adverse affect to threatened or endangered species. EPA has completed consultation with U.S. Fish and Wildlife Services and received concurrence with the Agency's findings on November 29, 2011.

If you have any questions, please do not hesitate to contact me or have your staff contact Cheryl Atkinson, at 215-814-3392.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

**ENVIRONMENTAL PROTECTION AGENCY (EPA), REGION III
WEST VIRGINIA REQUIREMENTS GOVERNING
WATER QUALITY STANDARDS (WQS)
2011 TRIENNIAL REVIEW
(Revised January 2012)**

EPA Approval of New and Revised Items

§47-2-2.2 Definition for Cool Water Lakes

West Virginia added a definition for “cool water lakes” in 2008 when it first adopted nutrient criteria. At that time EPA deferred action on West Virginia’s proposed lake nutrient criteria including the definition of cool water lakes. EPA reviews definitions in the context in which they are used within newly adopted or revised water quality standards. Approval of nutrient criteria for cool water lakes as described below includes approval of this term as applied in the approved WQS.

§47-2-3.2.g Conditions Not Allowable In State Waters. Algae blooms

West Virginia added algae blooms as a condition not allowed in State waters. The revision prohibits pollution that would cause or contribute to algae blooms which may impair or interfere with the designated uses of the affected waters. West Virginia stated in its 2011 WQS submittal that it added this WQS to clarify that algae blooms have the potential to interfere with designated use attainment and are not a desired condition. This revision is consistent with the Clean Water Act (CWA) and EPA’s implementing regulations at 40 CFR 131.11(b)(2), which call for the establishment of narrative criteria to supplement numeric criteria, and is therefore approved. EPA currently has no recommendations for what constitutes an algae bloom.

§47-2-7.2.a.2 West Virginia Waters. Ohio River Exception to the One-Half Mile Rule

The revision extends the exception to the half-mile rule, which prohibits mixing zones near water supply intakes. Previously the exception applied only to one segment of the Ohio River, between river mile points 61.0 and 63.5, and was set to expire in September 2010. The revision permanently adopts the exception and also applies it to another segment of the Ohio, between mile points 70 and 71. EPA approved the original exception on June 16, 2010. The rationale for that approval still applies. See the June 16, 2010, letter from Jon M. Capacasa, EPA Region III Water Protection Division Director to Scott G. Mandirola, WVDEP Water and Waste Management Division. The CWA regulations do not impose a prohibition on mixing zones within a predetermined distance from water intakes. The half-mile rule exception simply allows consideration of whether a mixing zone of a particular pollutant is appropriate in those segments of the Ohio, as determined by the mixing zone regulations. Because the regulation, as modified by the revision, is still protective of the public water supply use and consistent with the CWA regulations, the Region approves this revision.

§47-2-7.2.d.16.2 West Virginia Waters. Socio-economic variance for Harmon Creek

This Section was deleted because it expired on July 1, 2009. These site-specific criteria are no longer necessary and were not supported. The already approved Statewide criteria now apply to this creek.

§47-2-7.2.d.19.3. West Virginia Waters. Ward Hollow of Davis Creek

The variance for Union Carbide Corporation's discharge to Ward Hollow of Davis Creek was extended from July 1, 2010 to July 1, 2014. EPA first approved the variance for chloride in September 2006. The basis for the approval was that naturally occurring chloride concentrations prevent attainment of the Statewide chloride criterion. West Virginia asserts in its July 2011 Rationale Document that the natural conditions that led to the variance still apply and that the variance provisions are consistent with 40 CFR 131.10(g). The Region finds that the variance is still consistent with the CWA. See the September 26, 2006, letter from Jon M. Capacasa, EPA Region III Water Protection Division Director to Lisa A. McClung, WVDEP Water and Waste Management Division.

§47-2-8.3.a.1. and 8.3.a.2. Specific Water Quality Criteria. Nutrient Criteria for West Virginia Lakes

West Virginia has adopted a provision that jointly applies numeric nutrient standards for total phosphorus and chlorophyll-a to protect West Virginia's cool and warm water lakes. The provision establishes the following:

- Total phosphorus shall not exceed 40 µg/L for warm water lakes and 30 µg/L for cool water lakes based on an average of samples collected during the period May 1 to October 31, and
- chlorophyll-a shall not exceed 20 µg/L for warm water lakes and 10 µg/L for cool water lakes based on an average of samples collected during the period May 1 to October 31.

History of West Virginia and EPA Actions

West Virginia began nutrient criteria development for lakes in 2002 with the establishment of a Nutrient Criteria Committee (NCC). This technical workgroup consisted of representatives of industry, municipalities, conservation groups, agriculture, and forestry, as well as various agencies. The NCC recommendations and approaches can be found in *April 21, 2006*

Recommended Nutrient Criteria for West Virginia Lakes Report, submitted by the West Virginia Rivers Coalition, the Cacapon Institute, the Conservation Fund's Freshwater Institute, and the Appalachian Center for the Economy and the Environment upon request to WVDEP for its consideration in proposing defensible criteria to the legislature and to EPA. In summary, the NCC made the following recommendations:

- Based on analyses of West Virginia data, phosphorus criteria should be between 23 and 53 µg/L. The number that is ultimately chosen would depend on how much risk of harm is to be tolerated. A phosphorus criterion near the low end of the range, 30 µg/L mean, should protect cold and cool water lakes from most if not all harms due to nutrients. A phosphorus criterion at the top of the range, 50 µg/L mean, may well protect warm water lakes from harm, but is unlikely to protect cool or cold water lakes.
- Chlorophyll-a criteria should also be different for cool and warm water lakes.
- The criteria should be based on the mean of the values for the growing season. Nutrient levels can be highly variable, especially in smaller water bodies. The consideration of an average value over the growing season allows for occasional higher values that may be associated with rainfall events. The median value was also considered, but the NCC and WVDEP believe that the average value is more appropriate than the median because it is affected more by occasional higher values, which can have an ecological impact. Expressing all nutrient criteria as means as opposed to percentiles is also crucial, as this will allow WVDEP to implement the criteria in assessment and permitting decisions.

Based on the NCC recommendations, West Virginia, as part of its 2008 Triennial WQS submittal to EPA, included the following lake nutrient criteria for EPA's review:

- Total phosphorus: 50 µg/L for warm water lakes and 30 µg/L for cool water lakes
- Chlorophyll-a: 30 µg/L for warm water lakes and 15 µg/L for cool water lakes

In EPA's September 2009 action letter to West Virginia on its 2008 WQS triennial, EPA deferred action on the above lake nutrient criteria.

For this triennial West Virginia has re-evaluated its 2008 criteria and has submitted to EPA for review and approval the following lake nutrient criteria:

- Total phosphorus: 40 µg/L for warm water lakes and 30 µg/L for cool water lakes
- Chlorophyll-a: 20 µg/L for warm water lakes and 10 µg/L for cool water lakes

West Virginia's Total Phosphorus Determination

According to West Virginia's 2011 Rationale, West Virginia looked at its total phosphorus data versus dissolved oxygen from lakes in Ecoregion XI¹ and concluded that at phosphorus levels as high as 41 µg/L, lakes are not likely to experience hypoxia in the epilimnion, even during hot summers with little rainfall. The 2011 Rationale also presented the NCC's position that nutrient enrichment should not decrease the attractiveness of lakes for anglers. To that end, the 2011 Rationale presented a study by Dr. Todd Petty of West Virginia University, where he compared

¹ EPA developed a national nutrient Ecoregion map to assist states in determining the basic topography associated with the aquatic environments in each state that may warrant the need for different nutrient criteria (EPA 822-BOO-OOI). All of West Virginia is in Ecoregion XI.

average phosphorus concentration and fishing quality in lakes. West Virginia summarized the following points from Dr. Todd's study:

- The comparison indicated that average fishery ratings increase as phosphorus in lakes increases from below 10 µg/L to as high as 35 µg/L.
- Higher nutrient levels lead to increased fish stocks, up to a point.
- At some point between total phosphorus concentrations of 35 and 53 µg/L the average fishery rating declines.

West Virginia Chlorophyll-a Determination

According to West Virginia, reliable chlorophyll-a data was lacking when the NCC was going through the process of establishing nutrient criteria. Due to this fact, the NCC relied heavily on Virginia's research. In addition, West Virginia is now relying on lake nutrient data collected from 2004 to 2009 to determine protective chlorophyll-a criteria. In summary West Virginia made the following conclusions from its data:

-For lakes where the average phosphorus concentration exceeds 50 µg/L

- Some of these lakes have been listed as impaired by nutrients and sediments in previous 305(b) reports.
- Very few of these lakes have corresponding high average chlorophyll-a values.
- The lakes that have high average phosphorus but low chlorophyll-a are generally lakes where sedimentation and/or turbidity are a problem. Such lakes should be considered impaired because of turbidity, not because of nutrients.

-For lakes where the average phosphorus concentrations exceed 40 µg/L but are less than 50 µg/L

- There are only 3 lakes in this category and 2 of them have been listed as impaired by nutrients and/or sediment.

-For lakes where the average phosphorus concentration exceeds 30 µg/L but is less than 40 µg/L

- Some of these lakes were classified as having excellent fisheries by DNR.
- None of these lakes has ever been classified as impaired by nutrient or sediment.

West Virginia's Conclusion on its Lake Nutrient Criteria

Based on the information above, West Virginia has determined that 40 µg/L phosphorus is protective of designated uses. West Virginia compared recent phosphorus results with local

knowledge of the lakes where data was available, focusing on lakes with average phosphorus levels in the 30 to 50 µg/L range, and determined that 40 µg/L was the best threshold to separate lakes that would be vulnerable to hypereutrophic condition from those that would not. However, because in cool lakes fisheries are vulnerable to anoxia in the hyperlimnion, West Virginia adopted 30 µg/L total phosphorus for cool water lakes. In addition, West Virginia adopted chlorophyll-a criteria for cool and warm water lakes of 10 µg/L and 20 µg/L, respectively.

EPA's Approval Rationale

The development and adoption of Statewide lake nutrient criteria is an important addition to West Virginia's water quality standards. The new criteria will provide a key element in the State and stakeholders' ongoing efforts to improve and protect the water quality of these important West Virginia water resources.

EPA researched several sources of information, conducted several independent statistical analyses of cited data used by WVDEP and conducted some mechanistic modeling in evaluating the appropriateness of these proposed nutrient criteria. All of the analyses were done without differentiating warm water lakes from cool water lakes, because the data set for cool water lakes is too small. The analyses described below allowed an in-depth review of the criteria adopted by West Virginia.

The Virginia Water Resources Research Center (VWRRC) study titled *Analysis of Nutrient-Response Characteristics to Support Criteria Development in Constructed Reservoirs* provided much information on all reservoirs in EPA Region III states. Total phosphorus and chlorophyll-a are highly correlated in the Region III states' reservoirs and the results of regression analysis indicated that when total phosphorus is 30 µg/L, one would expect a chlorophyll-a value of 10 µg/L. EPA re-analyzed the VWRRC study data using all available Region III data and confirmed this relationship between total phosphorus and chlorophyll-a.

The fisheries rating versus total phosphorus data in the 2008 rationale were also re-analyzed using a different approach based on risk assessment. Logistic regression was applied to estimate the point at which there was a 50% or greater likelihood that increased phosphorus levels would result in a fishery score worse than a good or excellent rating. The resulting regression was significant, and indicated that the point at which there was 50% likelihood that a fishery would not obtain a good score was at a total phosphorus value of 36 µg/L.

EPA's re-analysis of the recreational use perception survey in West Virginia's 2008 rationale indicates that a log₁₀-transformation of total phosphorus improved the model fit. Under this equation, the mid-point recreational score value occurred at a total phosphorus concentration of 46 µg/L. The midpoint value of this score is higher than the WV proposed total phosphorus criteria.

EPA ran a mechanistic model using DeGray Lake, a reservoir in Arkansas, as a surrogate for analysis of West Virginia warm water reservoirs. DeGray Lake is located in Ecoregion XI, the same ecoregion as all West Virginia lakes, and the analysis used temperature and light data derived from similar West Virginia reservoirs to more accurately represent conditions in West

Virginia. In a model of total phosphorus versus the maximum percentage of blue-green algae, the results suggest that at a total phosphorus concentration of 40 µg/L, there is a breakpoint above which algal blooms may consist almost entirely of blue-green algae. The total concentration of blue-green algae, however, is not predicted to reach toxic levels. The model results also suggest that the relative abundance of the various fish species present is not predicted to change at 40 µg/L.

Based on the analyses discussed above, EPA concurs with the State's conclusion that the total phosphorous and chlorophyll-a criteria are supportive of aquatic life and recreational uses. Therefore the Region has concluded that the lake nutrient criteria are consistent with the requirements of the CWA and EPA's implementing regulations at 40 CFR 131 and the Region approves West Virginia's new lake nutrient criteria.

Although EPA is hereby approving the lake nutrient criteria based on averages of total phosphorus and chlorophyll-a, EPA is taking no action on the number of samples referenced in West Virginia's regulation. The number of samples required to assure sufficiency of the data is an assessment methodology that does not relate to the magnitude, duration or frequency of a pollutant in affecting water uses. Neither does it relate to general policies of applicability as in the case of mixing zones or compliance schedules. Because the four-sample reference is not a water quality standard, it does not require EPA's approval under CWA section 303(c).

Appendix E, Table 1, 8.14 Iron

West Virginia revised its chronic iron criterion for trout waters from 0.5 mg/L to 1.0mg/L. According to West Virginia's 2011 Rationale, the revised iron criterion of 1.0 mg/L for trout waters is based the following:

- EPA's National Recommended iron water quality criteria for aquatic life and reflects the latest scientific knowledge.
- A study by Mendndez (WVDNR) that found iron should not exceed 1.37 mg/L to protect all developmental stages of brook trout. The revised iron criterion of 1.0 mg/L is less than the Mendndez finding and WVDEP believes will still be protective of trout waters.
- The WVDEP study titled *Trout Water Iron Modeling Project* conducted on two West Virginia trout stream (Elklick Run and Holcomb Run) showed a thriving brook trout population and numerous excursions of the existing (0.5 mg/l) trout water criterion.

The revised iron criterion is consistent with the latest CWA Section 304(a) criteria recommendations for the protection of aquatic life issued by EPA. Accordingly, the Region approves the revision. The criterion meets the requirements of 40 CFR 131.11 and is scientifically defensible as explained in EPA's Gold Book Quality Criteria for Water (1986).

Appendix E, Table 1, Footnote 4

West Virginia added “organoleptic effects” to its Category A Public Water Supply criteria that have been previously noted to only protect human health from toxic effects. The Region believes the adopted revision protects public water supply designated use and is consistent with federal requirements at 40 CFR 131.11. It is also consistent with the state narrative water quality criteria that prohibit taste and odor that would adversely affect designated uses. See § 47-2-3.2.2.

New and Revised Items where EPA is taking No Action

§47-2-7.2.d.7.1 West Virginia Waters. Flow in the main stem of the Monongahela River

West Virginia revised the specified minimum flow for the main stem of the Monongahela River, to account for the effect of the Stonewall Jackson Reservoir and its corresponding minimum flow to the Monongahela. While the provision specifies the effluent design flow for permitting, it does not establish a condition relating to the water quality of the Monongahela. Neither the current revision nor the prior version of this provision specify a level of protection for the river, or proscribe how to implement criteria to determine whether the river is attaining its designated uses. Rather, the provision relates to establishing effluent limitations in permits. Because this provision is not a WQS that expresses or affects the desired condition or level of protection for the water, and because the revision to this provision did not modify a water quality standard, the provision does not require approval under CWA Section 303(c).

§47-2-8.2.b & 8.2.b1 Specific Water Quality Criteria. Critical Design for the Ohio River

West Virginia added a critical design flow for determining effluent limits for carcinogens in the Ohio River between river mile points 68.0 and 70.0. The provision specifies the effluent design flow for permitting purposes. This revision does not establish a condition relating to the water quality of the Ohio. It does not specify a level of protection for the river, and does not relate to the application or implementation of criteria to determine whether the river is attaining its designated uses. Rather, this is a revision relating to establishing effluent limitations in permits. Because this revision is not a WQS that expresses or affects the desired condition or level of protection for the water, it is not a WQS that requires approval under CWA Section 303(c).

§47-2-8.3.a.2. Specific Water Quality Criteria. Nutrient Criteria for West Virginia Lakes

As described in the section explaining our approval of the lake nutrient criteria, EPA is taking no action on the reference to the sample size required to determine the concentrations of total phosphorus or chlorophyll-a in West Virginia’s waters. The number of samples required to assure sufficiency of the data is an assessment methodology, not a water quality standard. Thus it does not require EPA’s approval under CWA Section 303(c).

EPA Disapproval of New and Revised Items

§47-2-8.3.a.3. Specific Water Quality Criteria. Nutrient Criteria for West Virginia Lakes

This new provision provides that “[a] lake shall not be considered impaired based upon an average total phosphorus concentration in excess of the criterion established in section 8.3.a.2, unless the chlorophyll-a criterion established therein is also exceeded.” In support of this provision, West Virginia presents some evidence of several lakes in the State that exceed the TP criterion but do not exceed the chlorophyll-a criterion. While the State acknowledges that these lakes might be impaired, West Virginia argues that the impairment should be for turbidity or sediment, not for nutrients.

EPA’s regulations at 40 CFR 131.11(a)(1) require that “[s]tates must adopt those water quality criteria to protect the designated use. Such criteria must be based on sound scientific rationale.” As discussed above, the VWRRC study that looked at data from approximately 350 reservoirs in Region III found a strong relationship between total phosphorus and chlorophyll-a. Although turbidity can be a confounding factor in the total phosphorus -chlorophyll-a relationship, turbidity is variable within a waterbody. While in the riverine segment of a reservoir turbidity initially can inhibit photosynthesis, and thus algae growth, in reservoirs with high turbidity, chlorophyll-a levels tend to increase in the mid-lake transition zone as sediments settle out in the riverine segment. Thus even lakes with high turbidity are at risk for nutrient impairment if they have high levels of total phosphorus. Because West Virginia has not provided a sound scientific rationale in its submission to support how this provision is protective of designated uses in West Virginia’s lakes, EPA is disapproving §47-2-8.3.a.3. The result of this disapproval action is that §47-2-8.3.a.3 does not apply for CWA purposes.

West Virginia can remedy this decision by removing §47-2-8.3.a.3 from its WQS regulations, or by providing sufficient data and analysis to support a revised nutrient criteria provision which is protective of the applicable designated uses. EPA appreciates West Virginia’s interest and efforts in mitigating nitrogen and phosphorus pollution and remains available to West Virginia in assisting to derive scientifically and legally defensible approaches to protecting the State’s waters from nutrient pollution.