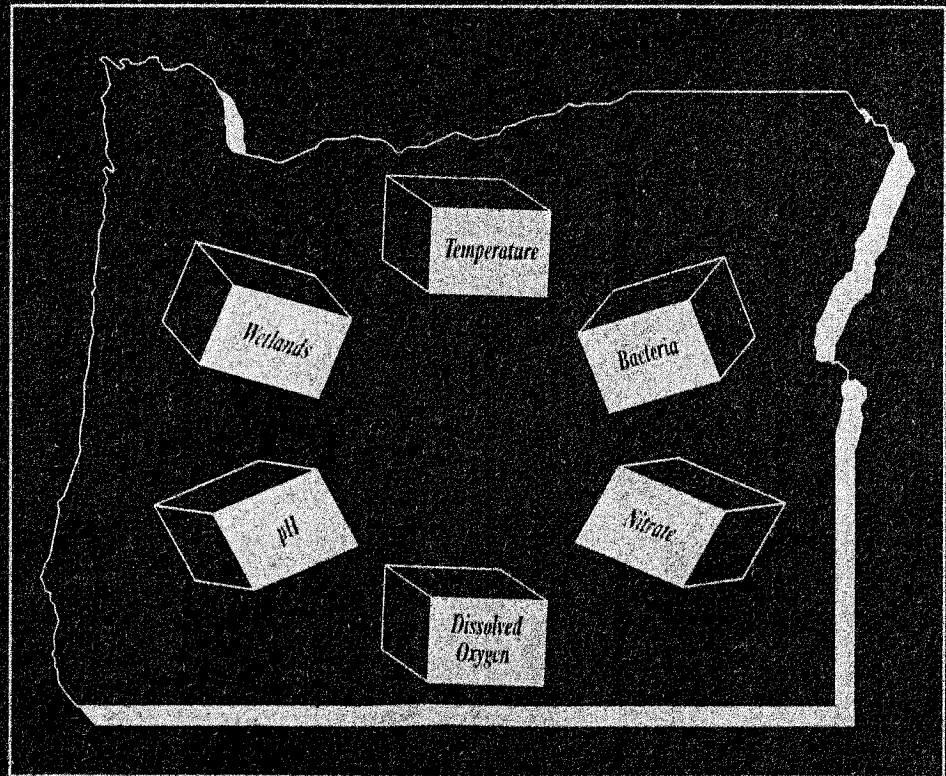


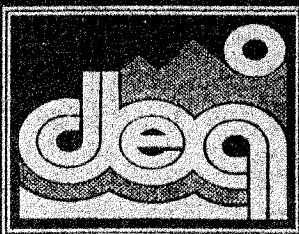
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# 1992 — 1994 Water Quality Standards Review

FINAL ISSUE PAPERS



*State of Oregon*



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# 1992 – 1994 Water Quality Standards Review

## EXECUTIVE SUMMARY

### WATER QUALITY STANDARDS AND THE TRIENNIAL REVIEW

**T**he Department of Environmental Quality is responsible for protecting water quality in the state of Oregon. To fulfill that responsibility, the Department sets in-stream water quality standards for each river basin. The standards are set with the goal of providing full protection to beneficial uses. Depending on the basins, beneficial uses may include: drinking water, anadromous fish passage and rearing, swimming, transportation, irrigation, hydropower, and other uses. Standards include narrative or numeric criteria and identification of the associated beneficial uses which they are intended to protect.

Under Section 303 of the federal *Clean Water Act*, states must review their water quality standards every 3 years in order to incorporate the most recent scientific findings and to reflect evolving priorities within society. The

review described in this document was begun in 1992 and is scheduled for completion in November 1995 when the Environmental Quality Commission will be asked to consider revising five existing standards. The standards under review include: groundwater nitrate, pH, bacteria, dissolved oxygen, and temperature. In addition to review of these standards, guidance for implementation of a portion of the state and federal antidegradation policy is also being developed, and a wetlands standard is being considered under a different timeframe.

### REVIEW PROCESS

A technical advisory committee (TAC) was established for each standard under review. Committee members were drawn from scientific and regulatory agencies, academia, and the regulated community. The technical committees provided suggestions for revising the standards based on recent scientific advances. A policy advisory committee (PAC) was also created to

reflect the views of stakeholder groups including a balance of industry, local government, environmental and recreation interests, and the general public.

The policy committee considered the suggestions of the scientific committees and worked with them to arrive at workable recommendations. The Department then notified a mailing list of approximately 900 interested persons of the Committees' recommendations, and held public workshops at six locations around the state. Based on the recommendations of the Advisory Committees and new information received during discussions with members of the public, the Department formulated its own recommendations and drafted proposed rule language.

The summaries below provide a brief overview of the reason for revising each standard, and the proposed revisions. Much greater detail on the scientific and policy rationale for the recommended rule changes is provided in the sections that follow.

## SUMMARY OF PROPOSED STANDARDS

### Groundwater Nitrate

- **Need to Regulate Groundwater Nitrate:** Protection of human health is the primary concern behind regulation of groundwater nitrate. Above certain concentration levels, nitrate in drinking water can cause reduced blood oxygen levels in infants. This condition is known as methemoglobinemia, or blue baby syndrome, which in its severe form can cause death.
- **Concerns With The Existing Standard:** The existing nitrate Maximum Measurable Level (MML) of 10 mg/L was adopted on an interim basis, pending further review by the Department. The interim criterion was based on the national drinking water standard established by EPA.
- **Department Recommendation:** In agreement with the recommendation of both the TAC and the PAC, the Department recommends permanent adoption of the interim criterion. Extensive studies by EPA and others have demonstrated that levels above this concentration may lead to health impacts. The number is widely accepted among public health officials as appropriate.

### Hydrogen Ion Concentration (pH)

- **Need to Regulate pH:** Spawning and rearing of salmonid fish species (includ-

ing salmon and trout) are the most sensitive beneficial uses affected by pH. Values of pH outside the range in which the species evolved may result in both direct and indirect toxic effects. Direct effects result from interactions with the mechanism that moves ions across cell membranes. Indirect effects occur when pH influences the availability and toxicity of metals, ammonia, and other potentially toxic ions in the water column.

- **Concerns with the Existing Standard:** Studies indicate that the existing pH criteria (which, depending on location allow a range from pH 6.5 to 9.0) are too restrictive. Many Cascade lakes may have naturally-occurring pHs as low as 6.0. Some basins in Eastern Oregon that currently must comply with a maximum criterion of 8.5 may have natural pHs as high as 9.0.

Having a rule that is too stringent is a problem because the State is required to respond to violations of its standards, even if they don't reflect actual water quality problems. In such cases, the Department is legally obliged to spend time and money either preventing further violations or proving that the natural conditions exceed the criteria. It would be more efficient for the Department to simply allow for natural conditions in the standard rather than having to prove stream-by-stream what the natural conditions would be.

- **Department Recommendation:** In agreement with the recommendation of both the TAC and the PAC, the De-

partment recommends that in Cascade lakes where the natural pH is lower than the existing standard of 6.5, the criterion should be changed to allow pHs of 6.0. Correspondingly, in certain basins in Eastern Oregon where pHs can naturally reach 9.0, the criterion should be raised from 8.5 to 9.0. To assure that high pHs in the Eastern waters are truly the result of naturally occurring processes, a study would be initiated in the appropriate basin when pHs of 8.7 or higher are detected. A violation of the standard would be triggered at pHs above 9.0.

### Bacteria

- **Need to Regulate Bacteria:** Protection of Oregonians engaged in water contact recreation such as swimming or windsurfing is the main reason for regulating water-borne pathogens. (Separate standards exist for drinking water.) Contact with or ingestion of bacteria, viruses, protozoa, and other microbes can cause skin and respiratory ailments, gastroenteritis, and other illnesses. Certain species of bacteria are used as indicators for the presence of other microbes because of their common fecal origin and the relative ease by which they can be counted. By controlling the presence of these bacteria, the Department assumes that other harmful microorganisms are also being controlled.
- **Concerns with the Existing Standard:** Studies conducted by EPA and experience among sewage treatment plant manag-

ers indicate that a standard could be devised that would be as protective as, and more efficient than, the existing interim bacteria standard.

- **Department Recommendation:** Following the recommendation of the PAC, the Department recommends adoption of a multi-faceted bacteria standard that includes the following major elements:

- Change from the use of fecal coliform or *Enterococci* species to *Escherichia coli* (*E. coli*) as the indicator species for the numeric criteria. Set an in-stream 30-day log mean limit of 126 *E. coli* per 100 ml. Require that single in-stream and effluent exceedances of more than 406 *E. coli* per 100 ml be followed up with additional testing to determine whether a systematic or long-term problem exists.
- Adopt a narrative criterion that prohibits surface water discharge of untreated human fecal matter. Some exceptions to the prohibition would apply:
  - The EQC could approve basin management plans that allow for limited overflows from sanitary and combined sewer systems.
  - Statewide, by the year 2010, overflows of sewage during winter would be allowed only due to a one- in five-year storm event or greater. Beginning

upon rule adoption, overflows during summer could occur only because of a 10-year/24-hour storm or greater. New treatment facilities would need to be designed to meet these conditions from the outset.

- Managers of storm sewers would be required to remove illicit and cross connections within 10 years from rule adoption.
- Contamination from non-point sources and nonanthropogenic sources should be minimized through use of best management practices and treatment technologies.

### Temperature

- **Need to Regulate Temperature:** Channelization, sedimentation, loss of shade, and other results of human activities have caused widescale warming of the state's surface waters. Salmonids are particularly sensitive to these changes, and are the beneficial uses of primary concern for the temperature standard.
- **Concerns with the Existing Standard:** The existing standard is written as a maximum allowable increase above natural conditions due to human activity. Because the reason for high temperatures must be assessed before a violation is proven, implementation and enforcement of the standard requires resources in excess of those available to the Department. Additional problems

exist: details such as the temperature unit of concern, the size of stream segment affected, and the allocation of thermal loading among dischargers are not specified. Finally, the existing standard is inequitable and may be unnecessarily stringent in some situations.

- **Department Recommendation:** In agreement with the recommendation of the PAC, the Department recommends that a criterion of 64°F be set for all surface waters. The criterion would be measured as a rolling 7-day average of daily maximum temperatures. A number of exceptions to this criterion are suggested:

- Waterbodies serving as habitat to Bull Trout should not exceed maximum temperatures higher than 50°F.
- Waterbodies in which salmonid species spawn or rear should not exceed 55°F during the spawning and rearing seasons.
- A criterion of 68°F would be set for the lower Willamette and Columbia rivers.
- During periods of flow that are below the 7Q10 level (i.e., the lowest consecutive 7-day average flow recorded in a 10-year period), or when air temperatures are above the 90th percentile of the 7-day average maximum air temperature, the 64°F criterion could be waived.
- One degree (1°F) cumula-

tive increase in stream temperature could be allowed from new sources when stream temperatures are above 64°F.

- The Environmental Quality Commission could allow individual sources to exceed the relevant criterion if the source demonstrates that beneficial uses would be fully protected in the watershed.

The Department recommends special protection for: cold-water refugia, threatened and endangered species, and waterbodies where dissolved oxygen levels are within 0.5 mg/L of the dissolved oxygen criteria. The Department also suggests that lakes and estuaries receive protection from temperature increases caused by human activities.

### **Dissolved Oxygen (DO)**

- ***Need to Regulate Dissolved Oxygen:*** Dissolved oxygen is important for maintaining a healthy and balanced distribution of aquatic life, and was one of the earliest measures chosen for protecting water quality. Salmonid species are the most sensitive beneficial use affected by dissolved oxygen concentration. In particular, the juvenile stage of salmonids is sensitive to even slight reductions in oxygen during emergence from gravel spawning beds (known as "redds").
- ***Concerns With The Existing Standard:*** There are three main reasons to change the existing dissolved oxygen standard:

- Some of Oregon's dissolved oxygen criteria are expressed as saturation, while others are expressed as concentration. Concentration criteria better represent the needs of fish than do saturation criteria. The concentration of dissolved oxygen can be quite high in cold water at the same time that the saturation level is comparatively low; saturation-based criteria may therefore indicate problems when none actually exist.

- The concentration of dissolved oxygen needed to protect salmon, trout, or other species is the same statewide, whereas the present criteria are not. The current criterion of 75 percent of saturation in Eastern Oregon is not fully protective of salmon or trout.

- The present standard does not provide a direct measure of the oxygen needed to protect juvenile salmon in the gravel redds. The current criteria provide absolute minima, which are the easiest to regulate. However, the absolute criteria may be too conservative. Criteria that include minima and averages allow a more flexible approach to developing pollution limits where adequate data exist.

- ***Department Recommendation:*** In agreement with the recommendation of both the TAC and the PAC, the Department recommends that the dissolved oxygen criteria be identified as concentration,

rather than saturation, to better reflect the needs of aquatic resources and to reduce the number of streams that violate water quality criteria due to natural conditions. The recommended concentration criteria (presented in Table i-1) will also provide greater flexibility in establishing pollution control limits by allowing the use of seasonal averages, as well as minimums, in the standard (provided adequate data exist.) The recommended criteria are associated with four different biological conditions that may be defined as: salmonid spawning, other life stages of salmonids, cool-water aquatic life, and warm-water fish.

Proposed criteria are identical or numerically less strict than existing standards with the exception of cold-water resources in Eastern Oregon. Cold-water resources in Eastern Oregon will receive a similar or higher level of protection than under the current standard.

The Department proposes an intergravel dissolved oxygen standard that includes both a criterion and an action level. The criterion represents an acute threshold; oxygen levels below the criterion indicate poor to negligible survival of salmonids from the redd. The action level provides a threshold for optimum conditions. At dissolved oxygen concentrations between the criterion and the action level, survival may be affected through effects on the size, weight, and health of the juvenile salmon. If DO concentrations fall below the action level, the Department would be required

**Table i-1: Dissolved Oxygen & Intergravel Dissolved Oxygen Criteria  
(Applicable to All Basins)**

Class	Concentration and Period <sup>1</sup>				Use/Level of Protection
	30D	7D	7mi	Min	
<u>Salmonid Spawning</u>		<u>11<sup>4,5</sup></u>		<u>9<sup>5</sup></u> <u>8<sup>2</sup></u>   <u>6<sup>3</sup></u>	Principal use of salmonid spawning and incubation of embryos until emergence from the gravels. Low risk of impairment to cold-water aquatic life, other native fish and invertebrates. The IGDO criteria represents an acute threshold for survival based on field studies.
<u>Cold Water</u>	<u>8<sup>6</sup></u>		<u>6.5</u>	<u>6</u>	Principally cold-water communities. Salmon, trout, cold-water invertebrates, and other native cool-water species exist throughout all or most of the year. Juvenile anadromous salmonids may rear throughout the year. No measurable risk level for these communities
<u>Cool Water</u>	<u>6.5</u>		<u>5</u>	<u>4</u>	Mixed native cool-water species, such as sculpins, smelt, and lampreys. Waterbodies includes estuaries. Salmonids and other cold-water biota may be present during part or all of the year but do not form a dominant component of the community structure. No measurable risk to cool-water species, slight risk to cold-water species present.
<u>Warm Water</u>	<u>5.5</u>			<u>4</u>	Waterbodies whose aquatic life beneficial uses are characterized by introduced, or native, warm-water species.
<u>No Risk</u>	<u>No Change from Background</u>				The only DO criterion that provides no additional risk is "no change from background." Waterbodies accorded this level of protection include marine waters and waters in Wilderness areas.

<sup>1</sup> 30-D = 30-day mean minimum as defined in definitions section.

7-D = Seven (7) day mean minimum as defined in definitions section.

7mi = Seven (7) day minimum mean as defined in the definitions section.

Min = Absolute minimums for surface samples, spatial median minimum of IGDO

<sup>2</sup> Intergravel DO action level, spatial median.

<sup>3</sup> Intergravel DO standard criteria, spatial median.

<sup>4</sup> When Intergravel DO levels are 8.0 or greater, 7-day DO levels may be as low as 9.0, without triggering a violation.

<sup>5</sup> If conditions of altitude and natural temperature preclude achievement of the footnoted criteria, then 95% saturation applies.

<sup>6</sup> If conditions of altitude and natural temperature preclude achievement of 8 mg/L, then 90% saturation applies.

Shaded values present the absolute minimum criteria, unless the Department believes adequate data exists to apply the multiple criteria and associated periods.

to determine if the low values are due to natural conditions.

## **Wetlands**

- ***Need to Regulate Wetlands:*** Wetlands need protection because of the many benefits they provide, including provision of several ecological functions: biological filtration, reduction of runoff and sediment buildup in streams, replenishment of groundwater, provision of habitat for migratory water fowl and other aquatic species, and other uses. In

Oregon, approximately 38 percent of naturally-occurring wetlands have been converted to other uses.

- ***Concerns with Existing Rule:*** The federal *Clean Water Act* mandates that states adopt standards to protect "waters of the nation". In Oregon, wetlands are protected by the antidegradation policy, and through an interpretation of administrative rule that implicitly recognizes them as "waters of the state". EPA recommends that states write rules that make this def-

inition explicit. In addition, the beneficial uses associated with wetlands often differ from those designated for the basins within which they occur; existing basin criteria are correspondingly inappropriate for application to wetlands.

- ***Department Recommendation:*** No recommendation has yet been made. Discussion of a possible wetlands standard is ongoing, and a recommendation is expected within a year from the date of publication of this document.



**This report contains Issue Papers that document review of the following water quality parameters:**

**Temperature**

**Dissolved Oxygen (DO)**

**Bacteria**

**Hydrogen Ion Concentration (pH)**

**Groundwater Nitrate**

**Wetlands**

The 1992-1994 Triennial Water Quality Standards Review addressed Wetlands in addition to the above standards. However, the wetland review is scheduled for later completion, and will be published separately.