

State of Oregon
Department of Environmental Quality

Memorandum

Date: June 2, 2014

To: Environmental Quality Commission

From: Dick Pedersen, Director

Subject: Agenda item O, Informational item: Water quality management approach for temperature
June 18-19, 2014, EQC meeting

Purpose of item DEQ staff will present information on the factors affecting stream temperature, the effects of stream temperature on aquatic biology and ecology and how Oregon's temperature standard is constructed to maintain and restore natural thermal regimes. In addition, staff will present information on the scientific and policy basis for the Protecting Cold Water criterion and how temperature TMDLs are used as a tool to restore natural thermal regimes to meet temperature water quality standards and support beneficial uses throughout basins. Specifics of the temperature TMDL process will be described with information from the MidCoast TMDL temperature development process. DEQ will present additional information on water quality management on forest lands in Washington State to address questions raised at previous EQC meetings.

This information is relevant because the Board of Forestry's current rule analysis for small and medium fish-bearing streams to address the Protecting Cold Water criterion of the temperature standard has raised questions about Oregon's temperature standard and related Total Maximum Daily Loads, including how the PCW compares to equivalent standards in neighboring states. The Oregon legislature established a cooperative relationship between the Oregon Departments of Environmental Quality and Forestry to implement water quality protections on non-federal forestlands. The Environmental Quality Commission sets water quality standards, and the Board of Forestry ensures forest practices meet those standards on state and private forestlands.

Background Stream temperature represents the average heat content, or thermal energy, of a waterbody. Changes in temperature can result from changes in heat content or changes in the mass of water. The largest increases in thermal energy in Oregon streams are typically due to solar radiation, either direct or diffuse, and shade is the main control for solar radiation. Other changes in temperature come from thermal radiation, heat conduction with the streambed, a gain or loss of water in the

stream, convection between and within the stream and the air and evaporation. Gain or loss of thermal energy through these mechanisms is small relative to the potential heat gain from solar radiation. Changes in mass of water include gaining or losing water to groundwater, hyporheic flow or human activities, downstream flow, and stream junctions. Added heat due to canopy opening will not be completely removed by heat loss processes, but the effects of an opening become proportionally smaller as the water moves downstream.

The commission's temperature policy is to minimize human-generated sources of heat and to protect and restore natural thermal regimes in order to protect aquatic ecosystems. Oregon's temperature water quality standard currently has three major sets of criteria: the Biologically-based Numeric Criteria, the Protecting Cold Water Criteria and the Human Use Allowance. The Biologically-based Numeric Criteria and associated maps and tables provide absolute limits on stream temperature based on designated use such as spawning, core cold water habitat, rearing and migration, location and time of year. A primary purpose of these criteria is for listing waterbodies as impaired.

The Protecting Cold Water criterion restricts anthropogenic warming in waterbodies that meet the Biologically-based Numeric Criteria to no more than 0.3°C above the ambient temperature for all sources combined. This is evaluated at the point of maximum impact where salmon, steelhead, or bull trout are present. The Human Use Allowance applies to waterbodies that exceed the relevant Biologically-based Numeric Criteria and restricts anthropogenic warming to no more than 0.3°C above the relevant Biologically-based Numeric Criteria. Point sources are not allowed to increase stream temperature more than 0.3°C above the relevant Biologically-based Numeric Criteria prior to issuance of a TMDL. During development of a TMDL or other cumulative effects analysis, allocations of the Human Use Allowance are calculated and assigned to point and nonpoint sources, reserve capacity, and a margin of safety; the sum of these allocations cannot exceed 0.3°C. The TMDL is issued as an order and with EPA approval the allocations are used in point source and nonpoint source water quality management.

**Temperature
TMDLs**

Temperature TMDLs calculate the listed waterbody's loading capacity for heat and the heat loads for natural, point and nonpoint sources. The excess load is the amount by which loading from all sources exceed the waterbody's loading capacity. Anthropogenic sources receive allocations of the 0.3°C limit, called a wasteload allocation for point sources and a load allocation for nonpoint sources. Point sources comply with their wasteload allocations through meeting limits in

updated permits. Nonpoint sources typically receive load allocations as a single group or by sector, such as forestry, agriculture, rural residential or urban, which are then implemented by rules and plans administered by Oregon Departments of Forestry for nonfederal forestlands, Oregon Department of Agriculture for agricultural and rural residential lands, or local governments, state and federal agencies, or other entities named as a Designated Management Agency or Designated Source.

In developing the MidCoast Temperature TMDLs, DEQ is addressing sources of heat, particularly where poor riparian condition limits shade on waterbodies and allows excessive inputs of sunlight. DEQ staff are using remote sensing data from satellite images, aerial photographs, and remote sensing equipment to examine riparian condition and vegetation height to better understand where restoration will create the most benefits for the resources spent. By prioritizing restoration and including timelines and milestones for implementation, Designated Management Agencies will be able to implement management measures and restoration projects in a more cost-effective and environmental beneficial manner.

Washington and California criterion for protecting cold water

Washington's forest practice rule requirements for protection of shade and temperature are consistent with Oregon's standard and TMDL modeling of riparian conditions necessary to provide adequate shade. The State of Washington's water quality criterion for protecting cold water states that in a waterbody meeting its numeric criteria no more than a 2.8°C temperature increase from all nonpoint sources combined is allowed. In addition, Washington's antidegradation policy only allows a lowering of water quality if a Tier II antidegradation analysis shows there are no affordable alternatives. For temperature, a lowering of water quality is defined as an increase of 0.3°C or greater. As a result, the antidegradation requirements are the controlling standard used to measure efficacy of forestry practices. Efficacy of forest practices for temperature control in Washington is measured against this 0.3°C threshold. The 2.8°C limit ensures that even in the case of allowances after a Tier II analysis, total warming will still be limited.

California's North Coast Regional Water Board's temperature objectives, which are equivalent to water quality criteria, for intrastate cold waters are similar to Washington's in that there is an absolute warming limit of no more than 5°F (2.78°C) above "natural receiving water temperature" and an antidegradation-type objective limiting water temperature alterations "unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses." The Board's Temperature Policy also requires maintenance or achievement of "site-

specific potential effective shade” in riparian areas on private lands.

EQC action This item is informational only, and no commission action is requested.

Approved:

Jennifer Wigal, Water Quality Program manager

Eugene Foster, Watershed Management Section manager

Report prepared by Josh Seeds