Synopsis of Oregon Department of Environmental Quality presentation "*TMDL Development and Temperature TMDLs in the Rogue Basin*"

Presented by Gene Foster on Jan. 9, 2019 to the Oregon Board of Forestry.

The Clean Water Act (CWA) and Oregon statutes provide a framework for water pollution control, regulation, and associated continuing planning processes. The federal Environmental Protection Agency delegated CWA regulatory authority to the State of Oregon and is administered by the Environmental Quality Commission (EQC) with some authorities and responsibilities delegated to the Oregon Department of Environmental Quality (DEQ). The EQC sets water quality standards per the CWA and Oregon law but has delegated to DEQ assessment of attainment of water quality standards and Total Maximum Daily Load (TMDL) development with implementation authority.

In Oregon, one of the main reasons for not meeting water quality standards for temperature is lack of shade, often from removing trees in the riparian areas. However, there are other factors such as channel geomorphology, loss of cold water refugia, and streamflow.

The most prominent water quality standard for temperature is the biologically-based numeric criterion (NC) for the protection of aquatic life, mostly sensitive cold water species, with a focus on anadromous salmonids. The metric used to determine attainment of the NC is the 7-day average of daily maximum (7DADM) temperatures. DEQ monitors stream temperature continuously at some monitoring sites and every 2 months at ambient monitoring network sites. Sites for which the 7DADM exceeds the NC are listed on Category 5 of the 303(d) list of impaired water bodies.

Regarding temperature standards, climate change is considered in various ways. DEQ typically used 100-150 years of historic records for vegetation, high and low streamflows, and rainfall patterns. However, we realize this long term timeframe may not be a good predictor of our climate in the near future. DEQ thinks the last 5-10 years might be a better predictor of streamflow, and thereby try to pull in what climate could be in an area, and consider e.g., loss of snow. From the standards side, EQC adopted not just the NC, but the Protecting Coldwater Criterion (PCW). If waters are colder than the NC, anthropogenic activities should not increase stream temperature greater than 0.3 °C per the PCW. DEQ is still working through climate issues with our partner agencies.

To address non-attainment of the NC for a given water body, the department develops TMDLs. A TMDL is the maximum amount of pollutant that can go into water and still meet the water quality standard. These analyses for a water body identify water quality standard not being met, estimate existing pollutant loads from background and anthropogenic sources, and determine the capacity of watersheds to assimilate the pollutants and still meet the standard, from which they determine the excess pollutant load. The analysis links pollution sources to conditions in the water body. Finally, TMDLs allocate pollutant loads to point sources and nonpoint source sectors that, when implemented, will result in attaining the relevant water quality standard. TMDLs focus primarily on shade in temperature-listed water bodies, but also consider channel morphology and streamflow.

Figure 1 shows a conceptual diagram of assessing and allocating pollutant loads for TMDLs. The red bar on the left is the current condition of exceeding water temperature standards (indicated by the upper line). This standard includes both the NC and the human use allowance (HUA) of 0.3 °C. Any heat loading beyond the NC+HUA is excess load that needs to be reduced. The middle 3 sets of bars shows how pollutant loads are identified by source: non-point (beige; e.g., agriculture, forestry), point source (gray; e.g., wastewater treatment plants), and background (green). The thick bar on the right shows the load reductions based on the TMDL and how much of the pollutant load needs to be reduced based on its source. The margin of safety (MOS; required by CWA) allows for uncertainty in the analysis and to otherwise err on the side of beneficial uses. This uncertainty is addressed implicitly in model assumptions, or explicitly by reserving some of the load (such as 10%). RC is reserve capacity for unidentified sources or future growth.

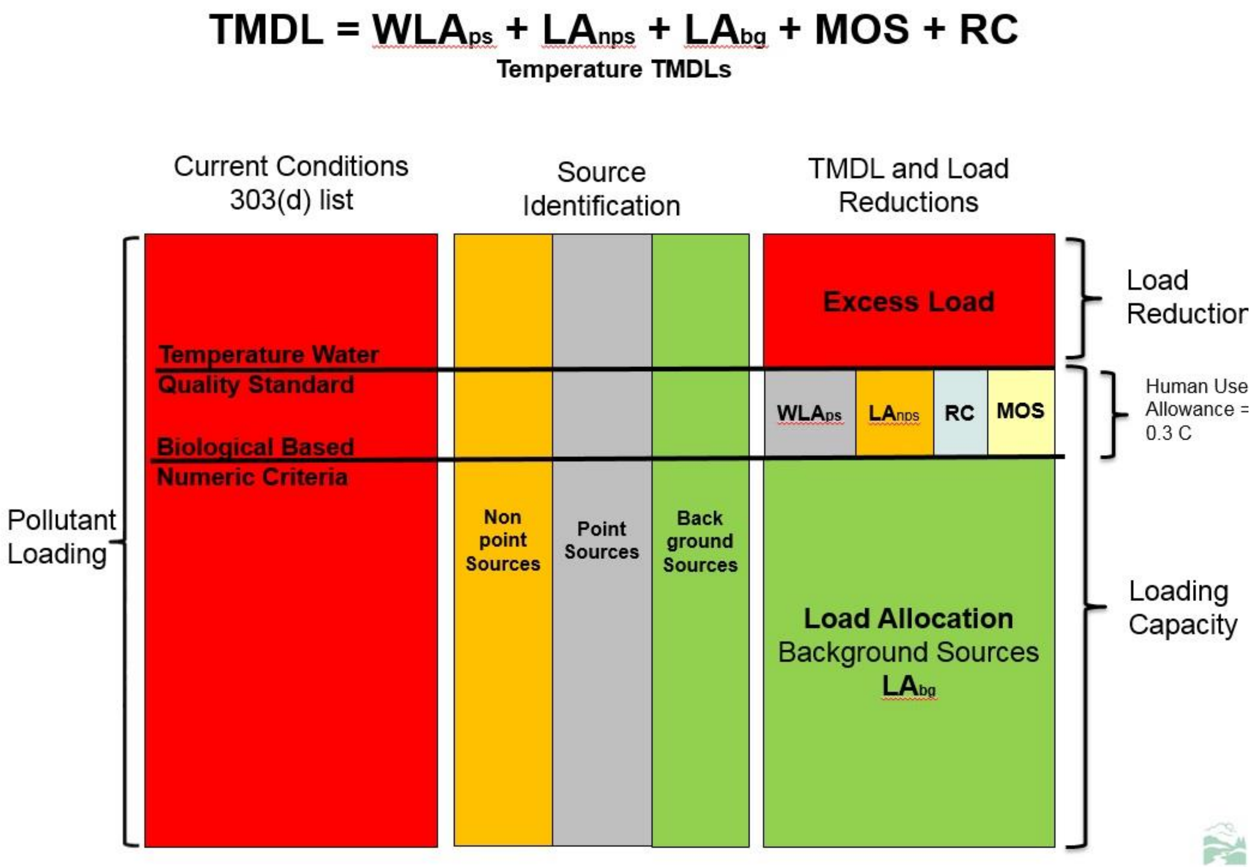

Figure 1. Development of TMDL.

Heat is the pollutant identified and allocated in temperature TMDLs that are translated into load allocations of shade for nonpoint sources and channel morphology and flow in some TMDLs. The 0.3 °C HUA is allocated to anthropogenic sources and margin of safety.

The TMDL, along with the Water Quality Management Plan (WQMP) and implementation plans, create an Integrated Watershed-Based Plan that specifies the desired condition and methods for controlling pollutant sources. TMDLs are part of the adaptive management process and continuing planning process for the Clean Water Act. The TMDL analyses and WQMPs are the first step of the process. Then, Implementation Plans are developed by Designated Management Agencies (DMAs) to meet TMDL allocations and WQMPs. The implementation process includes monitoring of the water bodies, sharing information with key stakeholders, learning from the process, and improving management, monitoring, and data analysis.

The DMAs are local, state or federal agencies that that have legal authority over a sector or source contributing pollutants. DMAs identified in previous TMDLs that have responsibility to implement

TMDLs include counties and municipalities, state departments (e.g., Oregon Department of Agriculture, ODF), and federal land managers (e.g., US Forest Service, BLM). Mapping of DMAs helps to identify potential pollutant sources and links DMAs for TMDL load allocations (Figure 2). Note that this mapping process does not focus on individual landowners, but on the DMA that has control or regulatory oversight.

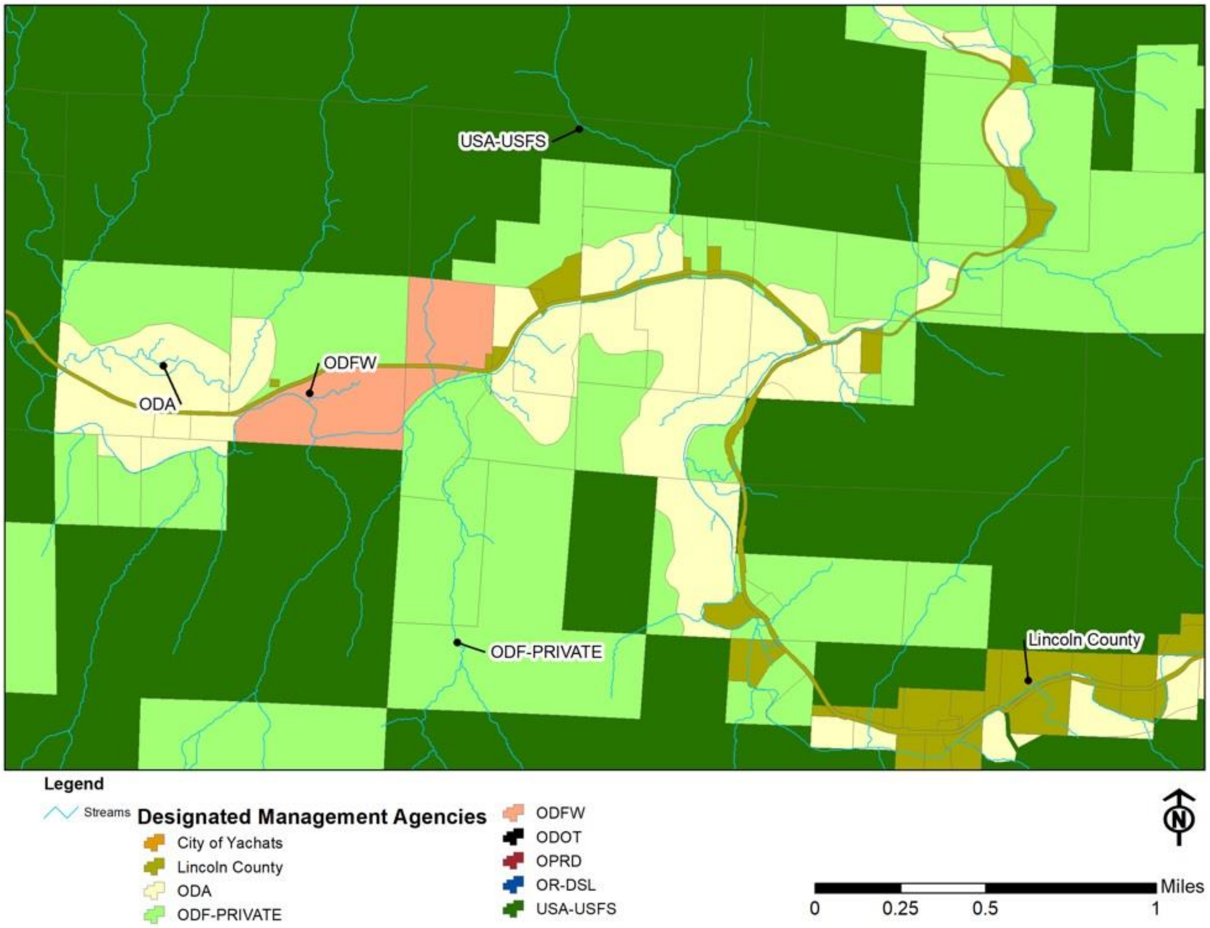

Figure 2. Mapping of designated management agencies. *[Note this example is from the Mid-Coast TMDL.]*

The Oregon Department of Forestry, as the DMA for private forestry, administers the Forest Practices Act (FPA). This act requires rules to ensure that forest practices meet water quality standards set by the EQC and TMDL allocations. Allocations in a TMDL are not water quality standards but are measures designed to bring a waterbody into compliance with CWA provisions. DMAs These rules are adopted by the Oregon Board of Forestry (Board). DEQ reviews and comments on these rules. The EQC may petition the for changes to rules, and the Board can petition the EQC to reconsider water quality standards and TMDLs.

Rogue Basin Temperature TMDLs

There were 10 water quality monitoring stations located throughout the Siskiyou georegion[1] that DEQ was able to access water quality data for this analysis (Figure 3). Most of the region is forested, but there is significant streamside range, agriculture, and urban areas. Forestland is a mix of private and federal land ownerships.

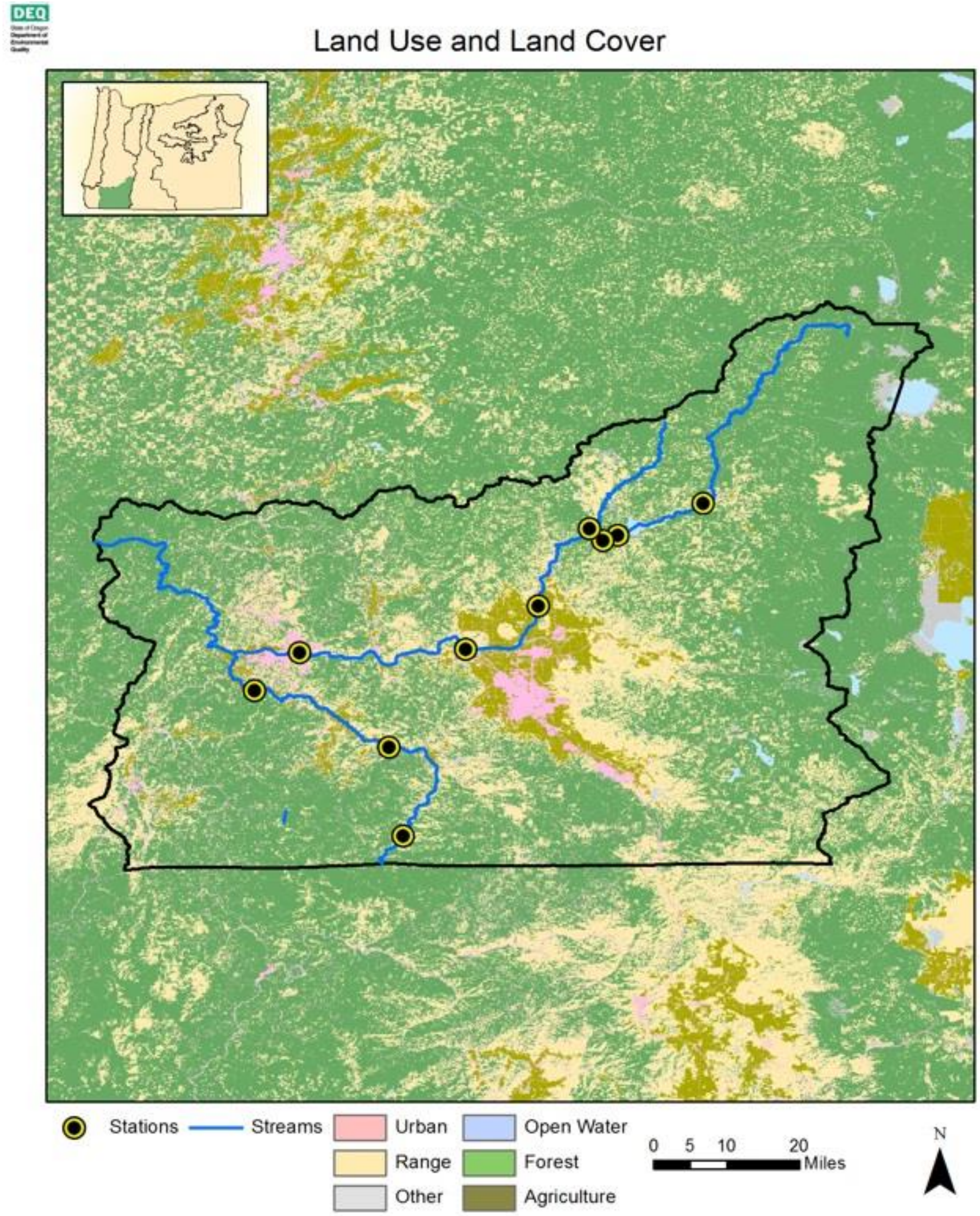

Figure 3. Water quality monitoring stations in the Siskiyou geographic region.

[1] Georegion and region are used interchangeably and refer to the FPA geographic regions in OAR 629-635-0220.

The following watersheds have temperature TMDLs:

- Applegate (issued in 2003, covers all streams)
- Bear Creek (issued in 1992 and again in 2007, covering all perennial and intermittent streams)
- Lobster Creek (issued in 2002, covering all perennial streams)
- Sucker Creek (issued in 2002, covering all streams)
- Rogue River Basin (issued in 2008, covering all perennial and intermittent streams)

Shade is allocated to nonpoint sources for meeting heat loading capacity in temperature TMDLs, Shade is usually allocated in TMDLs as effective shade based on the System Potential Vegetation (SPV). DEQ determines this vegetation using local ecology and historic vegetation data and input from a local stakeholder advisory committee about what vegetation should be growing along streams at different elevations. The resultant SPV is then modeled to determine how much shade would be there to compare with existing shade (which is determined from a model using current vegetation).

Here's an example of shade allocations along Elk Creek, which has some forestry along it (Figure 4). The X-axis is river km from the mouth of Elk River going upstream, and the Y-axis is effective shade. The black line is topographic shade e.g., hills. The red line represents the current shade, and the green line is predicted shade if the riparian zone contains SPV. This latter shade varies depending on stream width and potential vegetation types and density at particular sites.

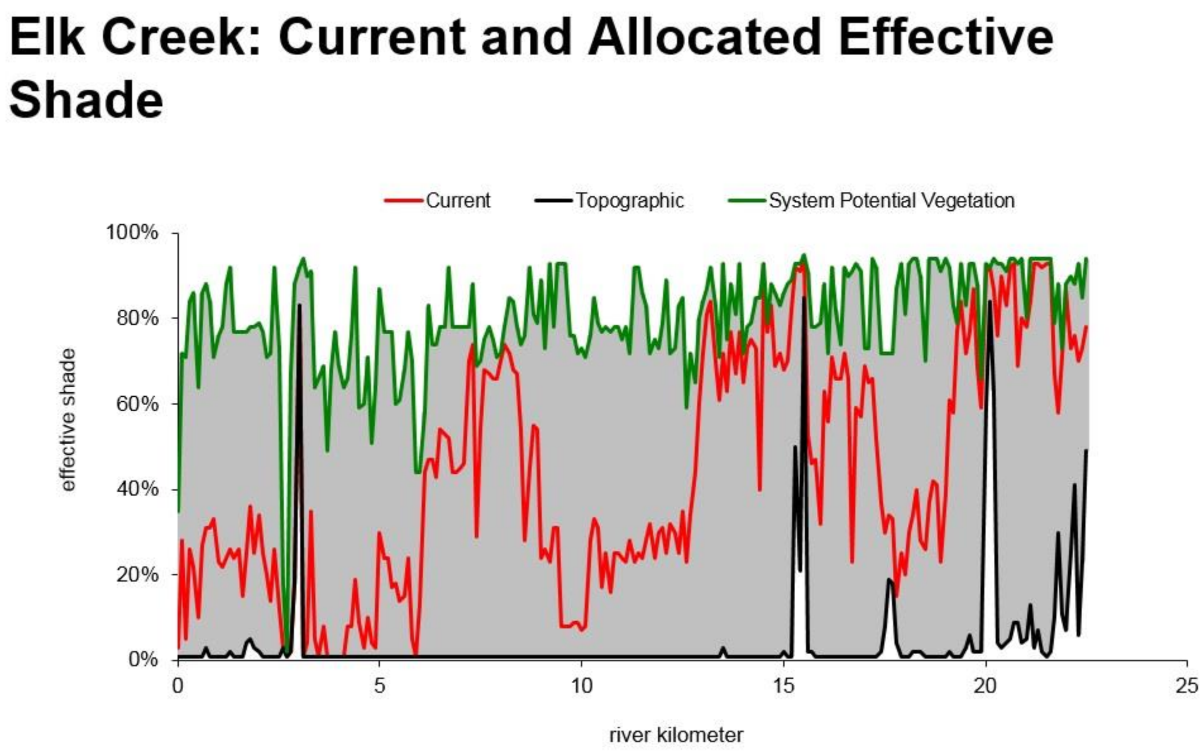

Figure 4. Elk Creek shade from various sources.

For this same creek, the 7DADM exceeded the NC for much of the last few years (Figure 5).

Current Temperature Regime Example (Elk Creek)

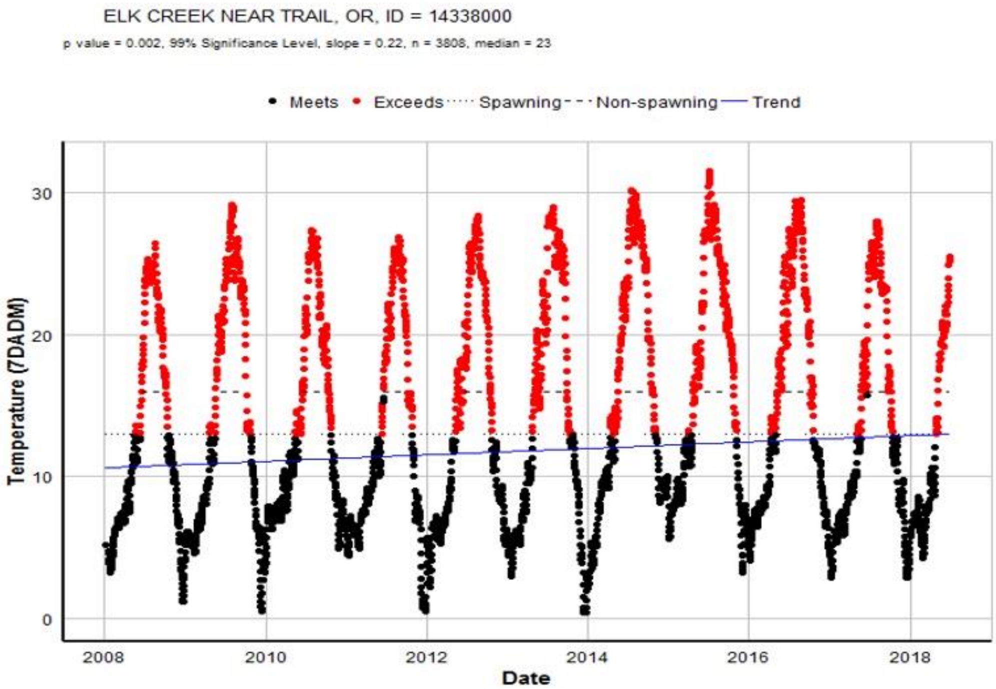

Figure 5. Elk Creek temperature as modeled from current vegetative conditions.

Regarding temperature status and trend, eight of ten stations in the Rogue Basin exceeded the NC for spawning and/or summer criteria. Four of the ten stations show worsening water quality, whereas the remainder do not show a trend.