*Water Quality: Current Trends and Expected Climate Change Impacts* (Proceedings of symposium H04 held during IUGG2011 in Melbourne, Australia, July 2011) (IAHS Publ. 348, 2011). 123-128

# Impacts of climate variability and change on water temperature in an urbanizing Oregon basin, USA

**HEEJUN CHANG**[1] **& KEN LAWLER**[2]

1 *Department of Geography, Portland State University, 1721 SW Broadway, Portland, Oregon 97201, USA*
changh@pdx.edu

2 *Department of Civil and Environmental Engineering, Portland State University, Portland, Oregon 97201, USA (now with Geosyntec Consultants)*

**Abstract** Climate variability and change can impose significant stresses on water quality. Water temperature is one important measure of stream health, and is directly affected by two expected ramifications of climate change: rising air temperature and reduced summer streamflow. We investigated the effects of hydroclimatic variability and potential warming on water temperature in the mainstem of the Tualatin River in Oregon. Analysis of US Geological Survey data for the period 1991–2009 shows that the temporal variations of water temperature can be best explained by lagged air temperature and streamflow amount ($R^2 = 0.80$). Simulations of synthetic ambient warming (1.5°C, 3°C) and streamflow decline (10%, 20%) scenarios using the water quality model CE-QUAL-W2 showed that: (1) summer water temperature increases are between 45 and 60% of ambient temperature increases, and (2) streamflow decline has a noticeable, but minor impact on water temperature. The number of days on which the 7-day running average of water temperature exceeded 20°C increased substantially during summer months. The spatial extent of reaches that violate the threshold value of temperature also expanded under the combined scenarios. When riparian areas are completely vegetated, water temperatures fall below the threshold level on the majority of summer days. Results of this study would be useful for establishing adaptation strategies in water temperature management under climate change scenarios.

**Key words** climate change; water temperature; flow; urban basin; Tualatin