Changing Climate, Changing Rivers

By Jeff Dose and Rich Grost

The Steamboaters, The North Umpqua Foundation, and Umpqua Watersheds helped sponsor a public forum presented by the Douglas County Global Warming Coalition on September 30th, at the Douglas County Library. The forum was well attended. The presenters, Dr. Gordon Grant and Dr. Gordie Reeves, are both experienced and respected researchers with the Pacific Northwest Research Station, a branch of the U. S. Forest Service, at Oregon State University.

Dr. Grant, a Research Hydrologist, began by describing the basic structure of the hydrologic systems that occur in western Oregon. He emphasized the role that geology plays in how precipitation is moderated as it travels into stream networks. Much of the Umpqua River basin, like most of western Oregon, is made up of a geology in which surface flow dominates the flow regime. In the Umpqua, Western Cascades and Tyee Sandstone (coast range) are the predominant geologies and are composed mostly of steep rocky slopes and shallow soils, which do not hold much water. This geology, combined with the precipitation pattern dominated by rain, yields "flashy" (fast rising and falling) winter flows and low summer flows in this part of the Umpqua Basin .

In contrast, the fractured basalt and deep pumice deposits of the High Cascades geology in the North Umpqua headwaters can absorb great quantities of precipitation and meter it out more gradually as groundwater through a network of springs. This geology, combined with a pattern of precipitation that was (historically) dominated by snow, results in a more uniform flow regime including relatively high and cold summer flows. Dr. Grant's modeling suggests that the most likely consequence of climate change on hydrology will be little impact to summer stream flows in the Western Cascade/Tyee Sandstone regions because the summer base flows are already very low, but rather, the High Cascades regions will likely see reductions in summer base flows, principally from the decrease in snow pack with warmer winter temperatures. However, Dr. Grant concluded with a conundrum, which was that the very low flows of 2015 did not actually get as low as he expected within either geology type – hence he plans to refine his models and hypotheses as more is learned about actual conditions.

Dr. Reeves discussed the impact of these hydrologic changes on fish production and diversity. He emphasized two points: First, that warmer water temperatures throughout the incubation period could cause salmon and steelhead to emerge earlier and perhaps suffer from in-opportune timing of emergence, growth, and out-migration; and second, that the reduction in snowpack and High Cascades flows would result in flows dropping to lower summer flows, sooner in the year, thus further stressing juvenile coldwater fish and perhaps even giving a competitive advantage to non-native cool-water predators. He added that climate change may cause further stressors

to our coldwater fish such as reduced ocean productivity due to acidification impacts (from CO2 emissions) on food chains, the likely result being slower growth and smaller adult fish and/or reduced survival; and that the amount of the basin with adverse hydrology and water temperatures will increase and for longer periods.

Combined, these effects will likely have severe impacts on our native aquatic systems over time, including salmon and steelhead. It was noted that salmon and steelhead have evolved with frequent and large scale local disturbances (volcanic eruptions, floods, forest fires, landslides, etc.) yet have persisted largely due to the wide variety of adaptations they exhibit, and the straying of about 10-20% of fish from most runs into other watersheds and overlapping of generations. But in contrast, the impacts of climate change may occur on a larger spatial scale than previously thought, potentially encompassing the entire range of many species. Dr. Reeves concluded that our current emphasis on managing for abundance of fish might not be the best strategy going forward, rather we should be managing our aquatic systems to retain the greatest diversity of fish life-histories, thus providing fish the most genetic variety for adapting to rapidly changing yet, variable conditions in our rivers and ocean.