**Introduction**

Rivers and streams within the Clackamas River Basin are not currently meeting water quality standards in terms of temperature. The Clackamas River Basin Council designed a restoration program to address the thermal loading on behalf of Portland General Electric in which native trees and shrubs are planted along streams to restore riparian canopy cover. Solar radiation can be blocked by restoring canopy cover and is an effective way to provide shade (Boyd and Kasper 2003). Stream and vegetation data were collected at nine sites in the Deep Creek subbasin to model the increase in shade from the restoration plantings. Using DEQ’s Shade-a-lator model, shade was predicted in future scenarios at 10, 20, and 50 years compared to the 2016 baseline condition.

**Results and Conclusions**

The modeling results suggest increases in effective shade (the amount of solar radiation blocked by vegetation or topography) ranging from 9%-63% depending on the site, with an overall average of a 34% increase within 50 years. The shade values are determined by the vegetation codes input into the model.

The results outline the importance of planting both fast growing species to provide shade early (e.g., Pacific willow), in addition to large tree species that will provide shade in the long term (e.g., Western red cedar). The predicted scenarios provide a framework to evaluate the effectiveness of CRBC’s restoration program, as they can be used as a guide to compare actual shade on these sites in the future. At sites where shade didn’t show significant increases, the restoration work provides ancillary environmental benefits such as enhanced wildlife habitat and erosion control (Lovell and Sullivan 2006).

**Methods**

Each site was gridded off into 10-foot by 50-foot buffer zones on each stream bank, up to 90 feet away from the stream, and along the length of the restoration plantings. In each buffer zone, canopy cover was measured with a densiometer at three points and averaged; the height and overhang of the existing vegetation were estimated. These data were used to assign each zone a vegetation code to be used for modeling. At each 50-foot interval along the stream, the following data were collected: elevation, aspect, wetted width, bankfull width, depth, and channel incision.