

**Qian, Song S. and Chauncey W. Anderson. "Exploring Factors Controlling Variability of Pesticide Concentrations in the Willamette River Basin Using Tree-Based Models." *Environmental Science and Technology* 33 (1999): 3332-3340. (Reviewed by Niko Hoskins)**

In this paper, the authors use classification and regression tree (CART) models to examine pesticide concentration levels at several points along the Willamette River. The data used was taken by the Oregon Department of Environmental Quality and initially analyzed by the US Geological Survey in 1990. Traditionally, models of pesticide concentrations involve linear models which lead to many complicated variables and a heavy amount of multiplicative dependencies between these variables. The CART method is recursively-based and has a distinct advantage in that the process reveals predictors rather than tests predictors, like in linear models.

This paper modeled eight pesticides: simazine, tebuthiuron, metolachlor, pronamide, diazinon, diuron, atrazine and desethylatrazine. Predictor variables which the authors made sure to examine included percentage of subbasin area covered by agricultural, residential or urban, and forested land uses, watershed suze, number of crops in the watershed, sampling site location, river water chemistry measurements, and month of the year when samples were taken.

In the end, land usage provided the most significant split for each pesticide except for simazine (longitude) and metolachlor (river water chemistry). The results found here weren't analyzed thoroughly because the purpose of this study was simply to see how effective the CART method could be in developing future water management plans. The authors were satisfied that this method is a valuable tool.

## **Critique**

A lot of the value from using these tree models is in the ability to test a large number of predictors all at once rather than trying to assign values or algorithms preemptively, like in linear models. The downside is that you still have to recognize predictors before you run a study. What this means is that you still have to approach the study with the thought in mind that, for example, land use is a predictor worthy of testing while biota isn't. Consequently, there is still a natural bias in your analysis. In this way, the CART method won't offer any groundbreaking results but it can assist in proving a popular hypothesis, such as agricultural land use contributing to high pesticide levels. So, for this method to be used as a reliable tool in recognizing predictors, an immense list of possible predictors must be used in addition to the ones used in this study. In other words, any breakthroughs in studying pesticide concentrations through this method will come from someone proposing a new predictor rather than the method providing insight.

[return to info sources page](#)

[return to home page](#)