SPARROWs, Lakes, and Nutrients?

Based on this title, you probably think I don't know what I am talking about. I mean really, what do sparrows, lakes, and nutrients have in common? In this case, a lot. So much so, an inter-agency team of US EPA researchers at the Atlantic Ecology Division in Narragnasett RI, and a USGS colleague in New Hampshire have been working together to better understand how these three seemingly disparate concepts can be linked together. Some of the results of this work are outlined in a recent publication in the Open Access journal, PLos One

Obviously, the sparrow I am referring to, isn't small and feathered, it is a regression model developed and refined by the U.S. Geological Survey (USGS). Since the late 1990's, USGS has been developing the SPARROW models which have been widely used to understand and predict the total amount of nutrients (among other materials) that streams are exposed to over the long-term. This is known as "nutrient load." These models are important because they give us a picture over a very large extent of where nutrients might be higher than we'd like.

However, when it comes to lakes, SPARROW doesn't provide the exact information we need. For our research on lakes, we need reasonable estimates of summertime nutrient concentrations, not long term annual load. This is important, because the higher the nutrient concentrations the greater the chance of algal blooms and more blooms means a greater risk of toxins. In order to better estimate the nutrient concentrations, we needed to use the SPARROW model for total load, but also account for the differences between load and concentration. Combining field data, data on lake volume and the SPARROW Model solved this problem.

In the paper "Estimating Summer Nutrient Concentrations in Northeastern Lakes from SPARROW Load Predictions and Modeled Lake Depth and Volume,", recently publisehd in PLoS One, we describe how we combined modeling information from SPARROW, summertime nutrient concentrations collected during US EPA Office of Water's 2007 National Lakes Assesment, and estimated lake volume (see this and this for more on that). The end result of this effort is better predictions, by an average of 18.7% and 19.0% for nitrogen and phosphorus, respectively.

Although an interesting science and statistics exercise, what is the meaning of this in terms of our environment, and importantly, the potential human health impacts? Well, if we are able to better predict concentrations of nutrients, that will hopefully also improve our ability to know where and when we might expect to see harmful algal blooms, and specifically cyanobacterial harmful algal blooms. Cyanobacteria have been associated with many human health issues from gastro-intestinal problems, to skin rash, and even a hypothesized association with Lou Gherigs Disease. So, in short, better predictions of nutrients, will, in the long run, improve our understanding of cyanobacteria and hopefully reduce the public's exposure to a potential threat to health.

Information about the author:

Jeff Hollister, a co-author on the study outlined in this blog post, is a research ecologist with an interest in landscape ecology, GIS, the statistical language R, and open science. The focus of Jeff's work is to develop computational and statistics tools to help with the cyanobacteria groups research efforts. Jeff is also an outpsoken advocate for open science and open access among his colleagues at the Atlantic Ecology Division.