Flathead Lake Biological Station
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Models Aren't Sexy…?

By Tom Bansak

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I talk to a lot of people. No seriously, a lot of people. It is currently a big portion of my job in Education, Outreach and Development at the Bio Station. Sometimes I talk to groups of 50 or more. Often middle or high school students. Their questions are just great. No filters. They usually have different perspectives and ideas than our neighboring cherry growers, shoreline home owners, the guys from the National Weather Service, summer tourists, custom scientific equipment fabricators, campus administrators, building contractors, retirees in paradise and fishermen. Yes, lots of fishermen.

And all of these diverse people have one thing resoundingly in common: When I mention the word "model" their eyes glaze over, their minds start to wander and some even fall asleep on their feet. Remember when you were in school and figured out how to doze in class, upright, undetectable? Well, I watch people do this standing in front of me when I say the word "model". Sometimes I just say the word to induce catatonia for my own enjoyment.

So why do scientists think that models are so exciting, yet most people do not relate to them? I was actually an avid model builder in my youth. With a Navy dad, I was a military history buff and spent many hours with Testor and Revell products, progressing from ships to planes and ultimately to sports cars as a teen. But these scientific models are different. They are computer models, where there is nothing tangible. Nothing to see. Nothing to relate to, except a concept.

However, their capabilities are astounding. Here's why – because they allow you to do whatever you can imagine to an ecosystem like Flathead Lake. And you can do it… cheap and fast. Or more like cheap-er and fast-er. Forecasting out 25 or 100 years for the cost of one scientist and some microprocessing chips is far less costly and burdensome than supporting multiple generations of field researchers. Plus, we would only know what is going on right now, which is basically what we know right now… without models.

Well at the Bio Station right now one of the most exciting and valuable modeling projects imaginable is underway. Due to the threat of coal mining in the Canadian North Fork Flathead in the 1970s, the Bio Station has one of the best long-term data sets in the world for the water quality and biological community of a large lake. These data were fastidiously collected by many dedicated researchers over decades. Then on top of this excellent data set we have arguably the world's most advanced lake model. Stay with me now. I know I just said "model".

This lake model has been painstakingly built and refined to reflect reality (as defined by available data, scientific expertise and best guesses…plus a lot of elbow grease and trial and error). This model is a compilation of the Estuary, Lake and Coastal Ocean Model plus the Computational Aquatic Ecosystem Dynamics Model, or ELCOM-CAEDYM in the biz. ELCOM-CAEDYM was originally created by a group of researchers at the University of Western Australia, led by Professor Jorg Imberger. We are fortunate at the Bio Station that three of our faculty, Bonnie Ellis, Mark Lorang and Jack Stanford, know and have worked with Jorg Imberger and are familiar with this model.

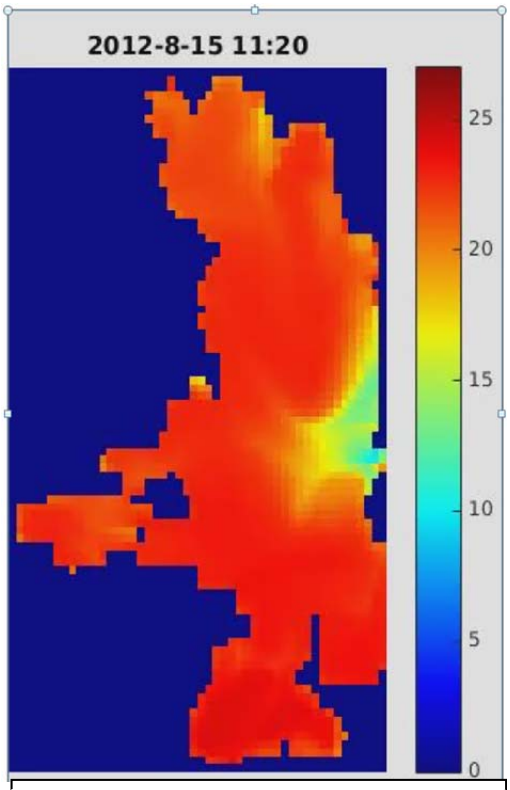
But familiar is not enough with a model. You need a workhorse. You need someone to spend hours and nights with that model. To get to know it, um, intimately. And that is what Postdocs are for.

A Postdoctoral Scholar (Postdoc) is someone who recently received their PhD but has not yet found a faculty position. They are newbies. Scientific pledges. And they can be wonderfully productive and brilliant. Because, at times their live-lihoods depend upon it. There can be wildly high expectations on them. Especially when they have been handed multiple lifetimes of scientific endeavors on Flathead Lake, and are asked to predict the future.

So right now at the Bio Station we have a Postdoc working on Flathead Lake modeling. His name is Dr. Shawn Devlin. He came to us by way of Finland and Wisconsin, both places with lots of lakes that have been examined in a very detailed and orderly fashion. He is very talented and driven. Shawn has been with us for about a year already, and we have him for another year (that we know of). He and his work are being funded by philanthropic gifts. Thank you!

In his first year, Shawn worked very closely with our long-term and recently retired lake ecologist, Dr. Bonnie Ellis. She basically data downloaded her 30+ years of experience on this wonderful lake to Shawn. And did I mention that he knows how to run the model!?!

So now Shawn gets to input (oh sorry, did I lose you again?) the premier lake monitoring data set – physical, chemical and biological – into the world's finest lake model and utilize our years of continuous weather data from LakeNET – the network of weather stations that we installed and maintain around Flathead Lake (http://flbs.umt.edu/lake/weather.aspx). If you recall from previous articles, weather (particularly wind) drives waves and currents which greatly influence movement of materials, the creatures and ecology of the lake. The model knows that.



Temperature modeling showing nearshore cooling due to a strong summer wind event.

So now we ask Shawn to put on his Swami hat and gaze into his crystal ball (aka LCD screen). What would happen if *Mysis* shrimp increased? What would happen if nutrient inputs dramatically increased from human activity? What would happen if lake trout were significantly reduced? What would happen if the dreaded zebra or quagga mussels made it to Flathead Lake? What would happen if it got really really hot?

These are the types of questions that a computer model can help us answer. The answers are very important and interesting to all of us who care about Flathead Lake. They are especially useful to the management agencies that are charged with making the decisions that affect Flathead Lake's future. And the Bio Station's modeling efforts (on the foundation of decades of detailed monitoring and field work) can make informed predictions based on the best available science. That is pretty amazing!

And perhaps most importantly, it will be faster than waiting 25 or 100 years and cheaper to pay a hungry Postdoc to do it.

So far Shawn has had fantastic success with the model. It has shown us that the lake is getting warmer… what we already know by sticking our toe in the water. But he did this with an R^2 of 0.97 (97%). An R^2 value is the statistical measure of how close real data fits with a model's prediction. A 97% fit is nearly unheard of. Many ecological scientists and managers are thrilled with something around 0.6 (60%). Shawn has already hit a scientific home run.

Now Shawn gets to tackle the questions beyond temperature. No pressure, but we are all awaiting results. With great challenges come great rewards. We are expecting a grand slam. Because Flathead Lake matters to all of us! This is exciting. Models are sexy.