

## **Summary of the Great Salt Lake Selenium Science Panel Meeting 11/08/05 – 11/09/05**

Panel Members Present:

Dr. Don Hayes  
Dr. Joseph Skorupa  
Dr. Theresa Presser  
Mr. Bill Wuerthele  
Dr. Bill Moellmer  
Dr. Bill Adams  
Dr. Anne Fairbrother (teleconferencing)

### **The Great Salt Lake Research Database**

Leland Myers reviewed the research database with the group. The Great Salt Lake literature review is available on a searchable disk. Contact Leland Myers or Wallace Gwynn for more information.

### **Round Robin**

William Moellmer reviewed the results of the Round Robin. Although HGAAS from USGS was not included, the results did come in and were close to the other labs. Moellmer noted that it appeared that the best method for the GSL Se analysis was HGAAS.

Bill Johnson commented that collision cell is a non specific interference removing method while DRC is a specific interference removing method. DRC must know what the interference is in order to remove it. Collision cell will remove all the interferences, no matter what that interference is.

Moellmer asked what should be done with the information from the round robin. Presser wanted to know if much of the State of Utah data was being jeopardized in light of the results. Moellmer replied that most data taken on the GSL since 1995 were analyzed by ICPMS and might be questionable, except for data that has been taken in the fresh water sources, such as the Bear River. Adams pointed out that, in order to establish a method, it was important to know what data is good and what data is needed.

Volatilization was discussed. A question arose as to why the deeper samples (7m) were losing selenium. Naftz pointed out that the peristaltic pump creates a vacuum that could cause volatilization. Hayes suggested having a procedure to capture the volatile part of selenium if that was causing loss of spikes.

Moellmer asked if the values obtained were also seen at the Salton Sea. Skorupa answered that samples taken from GSL and Salton Sea showed similar values in the 1.1-

1.5 ppb total Se in the water column. He expressed the need to look at tiered approached water, sediments, and biota.

Fairbrother pointed out the need to look at the low values or values of concern and not worry too much finessing the method for higher values because it was already known they were level of concern.

Adams said past GSL data should be still used for what it's worth. Wicker asked the panel if there was a need for further research to address the volatile selenium. Hydride Generation AAS was established as the preferred method with Agilent ICP collision cell and PE DRC as potential acceptable alternate method after further experience.

Skorupa said there should be a synoptic sampling of water, sediment, biota etc. to understand the temporal and spatial variability of Selenium. Johnson raised the concern that the project was being designed without first looking at the conceptual model.

Hayes suggested that an understanding of whether or not volatilization is a problem in the low level spikes should be investigated and then move forward, unless a research project on volatilization was needed. Adams noted that usually there is a loss in metals during HGAAS analysis. A 70-75% recovery is generally accepted in many labs. The round robin showed a 90% recovery, which was very good. Myers was willing to do a round of samples to understand how volatilization effects the Se concentrations by two methods: Kammerer bottle vs. a peristaltic pump.

### **Conceptual Model**

Bill Johnson presented the conceptual model. Skorupa asked why the concentration of prine oil was labeled irrelevant, with respect to diet selenium. Adams responded that it was back calculated from a paper that specified that the prine oil is very low with respect to diet. A discussion followed on the way of calculating the amounts of prine oil and diet. Skorupa and Adams suggested more research. Waddell suggested a spring model that captured the short term birds hatching on the Lake. Presser suggested adding that to the fall model.

The avocet model was explored. Pearce pointed out that Gwynn's book on the Lake had a few articles that describe their feeding habits. Darnall mentioned that a thesis was available about breeding habits of avocets around the Bear River. Miller said avocets will feed within a 50 meter radius of their nesting sites. The preference appeared to be the salicornia in shallow waters at the duck clubs where the freshwater sheet flow occurs. Skorupa confirmed that similar habits have been observed in the evaporation ponds of California. He added that the Se came from the diet and not from the tissue; otherwise, the last clutch should have less selenium due to depletion in tissue. However, he concluded that it has been observed that the same concentrations are present in the last as well as the first clutch. This shows that Se comes from the diet. Adams noted the lack of brine fly data. He mentioned that his data showed 1 to 1.6 ppm Se dw in the brine fly.

The panel agreed there should be at least three models for birds. Skorupa added algae as food source should also be looked at to be certain that they are or aren't significant.

Wuerthele asked Skorupa about testing sensitivity compared to dose. Skorupa said that at Kesterson, some species load up more selenium with respect to others. There was no data on eared grebes and there was information only on about half a dozen bird species. Wuerthele suggested looking at nesting success as an endpoint. Skorupa suggested using the stilts as a sentinel species to be safe.

Johnson was asked by Moellmer if the three bird models could be cut to one, focusing on the most sensitive species. It appeared that shovelers were nesting and feeding on the lake, more than other species. The birds were eating a good deal of the brine shrimp that seemed to have the highest concentration of selenium, with respect to brine flies and other food sources. Skorupa suggested a risk driven sampling. Wuerthele suggested including both the brine shrimp and the brine fly. Moellmer asked that eared grebes and shovelers should be included, since both were important. Pearce said it would be useful to have an overlay of bird usage on the GSL map. Skorupa said that April 15 to May 15 would be a good window to sample eggs. He suggested doing a bird survey to determine what birds to sample and where. Sampling should start at the selenium "hot spots."

Wuerthele and Fairbrother proposed setting up a mesocosm where birds feed, breed and hatch in cages. There, the food could be mingled with known brine shrimp concentration of selenium. Adams mentioned that a professor at Wyoming Laramie University was hired by his company (Rio Tinto) to repeat a laboratory study to understand the relationship between water, food, and shrimp concentrations. The Panel decided that it would be appropriate to measure the concentration of Se in the eggs and the brine shrimp and that the trophic transfer factor was needed.

Myers suggested completing the conceptual model and, at the same time, obtaining a permit to collect eggs. Richard Bay asked if the study could be started by examining the Kennecott discharge and the effects on the biota and ultimately on the birds. He also suggested starting a monitoring program allowing Kennecott and Jordan Valley Conservancy District to discharge in the GSL. Skorupa revisited the scope of the work as assessing the current status of the GSL and the dynamics of the response of GSL to an increased load. Adams suggested looking at the load to the Lake. Miller said that the loads coming into the GSL from the Bear and Jordan River are far greater than the Kennecott discharge. Naftz pointed out that the geochemical and biological are not well known and need to be explored. Moellmer asked the panel to explore Skorupa's concept of adaptive management. A discussion followed on how to quickly start understanding if increasing concentrations out at the Kennecott would be detrimental to the brine shrimps and the food chain and, at the same time, continue to move forward and understand the dose response time of the system.

Wuerthele suggested a two track approach with clear objectives for both. Hayes liked the approach as a way to get somewhere in the short term. He added that data gathering should be continued in the long term. Moellmer advised that the group should not

assume we have a problem or that we don't. Anne Fairbrother felt the question was what would cause a problem at the GSL were we see teratogenic effects.

The short and long term effects were summarized as follows:

Adams talked about some preliminary data collected by Kennecott. He noted that the eggs were mostly from stilts and avocets. There were few waterfowl. He added that Bill Mar in Australia has a tissue technique for Se. Johnson outlined the unknowns in the cycling of Se in the GSL as well as some issues that he felt the Science Panel needed to consider.

Adams pointed out it was important to understand the load and the flux of Se from and to the sediments. Hayes agreed there was very little information on the GSL. He said he liked the simplistic approach of looking at the immediate needs, including the issue with the water quality standard for Kennecott, and concurrently looking to understand the Lake's dynamics.

Hayes asked that data be gathered to determine what the Panel had and did not have and what was reliable. Johnson referred to the site, [www.greatsaltlake.utah.edu](http://www.greatsaltlake.utah.edu), for the hydrologic observatory database. He also proposed to link to data produced by the Science Panel.

Wuerthele suggested focusing on bird survey data, eggs, brine flies, brine shrimp, and identifying possible high priority sites or potential impaired nesting sites.

(See priority list from Science Panel on the UDEQ GSL Web page)

#### Next Meeting Agenda

WY data on Brine Shrimp study