Performance Work Statement

Algal Taxonomy Support

The US EPA’s Office of Research and Development (ORD) is engaging in research to provide the best science in a timely manner to allow for more effective water management decisions for the Nation’s existing water resource problems. One of these water resource problems is the emergence of harmful algal blooms (HABs) that deteriorate drinking water quality, fisheries, and the recreational value of the nation’s waters. HABs are controlled by a suite of factors including water temperature, nutrient loading, hydrology, and carbonate chemistry and predicting HAB events remains difficult for most water bodies. One approach ORD is using to better understand the factors controlling HAB events is the statistical analysis of existing HAB data sets. One such effort involves a data set supplied by the US Army Corp of Engineers (USACE) that spans 26 years and includes 20 reservoirs in the USACE Louisville District.

The USACE Louisville District includes 20 reservoirs in Indiana, Ohio, and Kentucky and the USACE has maintained a biological monitoring program for the reservoirs since at least 1978. The monitoring generally entails sample collection for phytoplankton identification and enumeration once per year from several sites within each reservoir. The taxonomic work is performed by a private vendor who bids on the USACE contract. Over the duration of the monitoring program numerous vendors and individual taxonomist have performed the taxonomic work, potentially leading to variability in the data due to differences in the experience level, skill, and equipment used among individual taxonomists. In addition, taxonomic classifications have changed over the past 25 years leading to the introduction of new species names and the elimination of others. Common names are particularly plastic and may vary over time and between individual taxonomists. The US EPA is seeking a vendor to “harmonize” the 26 year long record of phytoplankton taxonomy and abundance.

The majority of the observations (>95%) include reports of biovolume and cell counts for each taxa. For a small fraction of the observations only cell counts are reported. In most instances the per cell biovolume for taxa for which only cell counts were reported was measured in samples collected from the same lake on a different day. The US EPA will use the measured per cell biovolumes to estimate biovolumes when they are not reported.

**OBJECTIVES**

1. To update, quality check, and expand upon the taxonomic information contained in a list of phytoplankton taxa found during a long-term reservoir monitoring program.

2. To convert cell count reports to biovolume for the subset of the observations where biovolume is not reported.

**DESCRIPTION OF TASKS**

The contract activities can be broken into three distinct work phases. In the first phase the contractor will generate the additional taxonomic data described below. In the second phase the US EPA will review the list and the contractor will make any necessary changes. In the third phase the contractor will develop the Recommended Biovolume Source list.

*Phase 1*

The US EPA will provide the contractor with the Taxa List containing up to 2000 unique taxonomic names in the monitoring record. This document will be referred to as the Taxa List. Based on this information, the contractor will attempt to provide the corresponding Operational Taxonomic Unit (OTU), Division, Order, Family, Genus, Species, Variety, and Taxa Type for each of the provided taxonomic names. In many instances it will not be possible to provide all of this information. For example, if the original taxa name is reported as “unidentified green algae”, the contractor will not be able provide taxonomic data at a resolution greater than Division (i.e., chlorophytes). In other instances, the original report may contain identification to the species level that the contractor feels is unreliable. For example, numerous diatom species can only be differentiated using electron microscopy. If the original record contains a species level report for one of these taxa, it is likely unreliable and the contractor should only report taxonomic information to the level they feel is reliable. Another example is species that have recently been split into several species. In this instance the contractor should not report a species name. When taxonomic data provided by the contractor differs from the original record, the contractor must explain the discrepancy in a comment column. The comment column can also be used to enter other information the contractor feels is relevant, such as synonyms. The contractor must produce the revised taxa list within 60 days. At the end of phase 1 the contractor shall furnish the Draft Expanded Taxa List which is the original Taxa List with fields added for Operational Taxonomic Unit (OTU), Division, Order, Family, Genus, Species, Variety, Taxa Type, and Comments. Taxa Type will be either Diatoms, Green Algae, Cryptomonads, Blue-Green Algae, Euglenoids, Chrysophytes, Yellow-Green Algae, Dinoflagellates, Haptophytes, or Red Algae.

*Phase 2*

Phase 2 begins when the US EPA receives the Draft Expanded Taxa List from the contractor. This will happen within 60 days of when the contractor receives the original Taxa List from the US EPA. The US EPA will review the Draft Expanded Taxa List and provide a list of questions and requested clarifications to the contractor within 3 weeks. The contractor will respond to all questions and provide the Final Expanded Taxa List within 3 weeks. At the end of phase 2 the contractor shall furnish the Final Expanded Taxa List.

*Phase 3*

Within 3 weeks of receipt of the Final Expanded Taxa List , the EPA will provide a list called Missing Biovolume that contains all taxa by lake by sampling date combinations where taxa cell counts were reported, but biovolume was not. The EPA will provide a second list called Biovolume Source that contains a list of per cell biovolumes that were measured for all taxa by lake combinations represented in the Missing Biovolume list. The EPA will also furnish one biovolume data figure for each taxa by lake combination in the lists. Each figure will display per cell biovolume plotted against sampling date. Dates when the taxa was identified, but biovolume was not measured, will also be indicated in the figure. Within two weeks of this date the contractor and US EPA will convene a phone call to discuss the data and generate the Recommended Biovolume Source list. This list will be due within two weeks of the phone call. At the end of phase 3 of the contract the contractor shall provide a list, called Recommended Biovolume Source, of taxa x lake by date observations that should be used to generate per cell biovolume estimates for each observation in the Missing Biovolume list.

**DELIVERABLE**

The *phase 1* deliverable is Draft Expanded Taxa List and is due within 60 days of receipt of the Taxa List. The *phase 2* deliverable is the Final Expanded Taxa List and is due within 3 weeks of receiving the US EPA’s comments on the Draft Expanded Taxa List. The *phase 3* deliverable is the Recommended Biovolume Source which is due within two weeks of the US EPA – contractor phase 3 phone call.