

DATA MANAGEMENT PLAN

In accordance with NSF Award and Administration Guide (Chapter, VI.D.4), the following measures and policies will be undertaken as part of the proposed research:

1. Types of data, samples, and other materials to be produced in the course of the project. This project will produce the following types of data from microbial mat ecosystems of submerged sinkholes in Lake Huron:

- i. Biological data:
 - a. Sequence of DNA and cDNA
 - b. Appropriate cultures and types for erection of new species (under the International Code of Nomenclature for Algae, Fungi, and Plants)
 - c. Rates of oxygenic and anoxygenic photosynthesis, and chemosynthesis.
- ii. Physical data:
 - a. Water column profiles
 1. Water temp, depth, conductivity (YSI sensors and Ecowatch software)
 2. Light (PAR) (Hand recorded profile)
 - b. Location
 1. latitude/longitude
 - c. Time-series data in sinkhole
 1. Water temp, depth, conductivity (YSI sensors and Ecowatch software)
- iii. Chemical data:
 - a. Water column profiles (YSI sensors and Ecowatch software)
 1. Dissolved oxygen, pH
 - b. Time-series data in sinkhole (YSI sensors and Ecowatch software)
 - c. Concentration of nutrients, sulfate, nitrate, hydrogen sulfide, and various metabolites.
 - d. Time-series core profiles (Unisense SensorTrace software)
 1. Dissolved Oxygen (O₂)
 2. Hydrogen Sulfide (H₂S)
 3. pH
- iv. Imagery data
 - a. Images (both LM and SEM) of all photosynthetic strains in culture
 - b. Raw in-situ, time-series images of mat surface (GoPro)
 - c. Image analysis for percent purple/white
 - d. Images of cores during profiling

2. Standards to be used for data and metadata format and content.

As part of the proposed research, summary and data spreadsheets will be made compiling the samples collected and analytical results. The project summary spreadsheets (sample types collected, sample numbers, etc.) that list the samples and data that were collected/generated as part of the project will be shared to a project folder in the Open Science Framework (OSF) as well as backed up on GVSU/UNF servers. As appropriate, data generated by this project will be placed in OSF and backed up on the GVSU/UNF servers as well.

Data of type i, ii,iii, and iv c will ultimately be stored in or transcribed into MS excel spreadsheets, and any raw handwritten field data will be preserved in a hard copy lab notebook. Data of type iv a, b &d will be stored as raw image files (ex. Jpeg or TIF).

3. Methods and policies for providing access and enabling sharing.

Collaborators on this project will have access to an OSF project folder, where all raw and processed data generated will be organized and uploaded. During the project period this folder will be set to private accessible only to the collaborators with the link. One year after the two-year project period or after data publication, whichever comes first, the data will be made open and accessible to all. In the meantime, project activities will be made available on the Biddanda Lab website in the sinkhole activities section.

4. Provisions for re-use, re-distribution, and the production of derivatives.

As appropriate/possible, data and samples will be made available through the OSF project file for re-analysis or for new analyses by other groups. Citations for data will be appropriately attributed through authorship of publications and the OSF database. Outreach materials created by this project will be digitally archived for possible future redistribution.

5. Methods for archiving and preserving access to data and materials.

Raw and processed data will be backed up on GVSU/UNF servers, as well as uploaded to an OSF project folder. Data of type (i) will be deposited to public databases such as NCBI and IMG upon publication or two years after their generation. Cyanobacterial and diatom strains will be deposited in culture collections in the US and Europe. Data of types (ii), (iii), and (iv) will be published in peer-reviewed journals, will be made available on the lead PI's website, and will be further available upon request. The OSF project folder and files therein will be private until published or one year after the two-year project period ends, whichever comes first. Biological samples of mat material will be preserved in preservatives such as glutaraldehyde, or in *RNAlater*, or held frozen in a -80°C freezer for future use. Lastly, we will strive to make all publications resulting from this project open access.

We will host all project-related aquatic data on a project-specific data portal page at www.bco-dmo.org ensuring public access. The BCO-DMO project page will also have clear links to OSF repositories of other project data – such as field images and microbial genetic data – that are also available to all users.