Metadata template[[1]](#footnote-1) for datasets of *L&O-Letters* articles

**Instructions:**

Metadata provides enough structured information for other scientists to understand and use your data. To prepare your metadata, you will need to fill in the information in the tables below and take the followings steps:

1. Fill in the tables below for your dataset that you will be making available. If you have more than one dataset, then fill in information requested for Table 2 (the data dictionary) for each dataset.
2. Save this file in this RTF format and upload your metadata to the *L&O-Letters* website when you submit your manuscript.
3. Timing of depositing your data in a repository: You should submit your data to a repository at the time of submission, however, you do not need to provide the link to the data until the manuscript has received a decision of major or minor revision. During the review process, we will review your metadata. In some cases, reviewers may ask for the data during the review stage, at which point you need to make it available.

[PLEASE DELETE THESE INSTRUCTIONS ONCE YOU FILL THIS FORM IN]

**Table 1.** Description of the fields needed to describe the creation of your dataset.

|  |  |
| --- | --- |
| **Title of dataset** | Dataset: Impact of salinization on lake stratification and mixing |
| **URL of dataset** | Forthcoming upon decision at the first review stage |
| **Abstract** | Anthropogenic freshwater salinization is predicted to affect thousands of lakes worldwide. High salt concentrations are detrimental to aquatic ecology, but can also affect lake mixing and stratification regimes, which in turn have large consequences on lake biogeochemistry and habitability. While there have been case studies which have documented a change in lake mixing regimes due to high salt inputs, little is known about how salt concentrations may shift timing of lake stratification and mixing, and at what thresholds lakes may shift from dimictic regimes to monomictic or meromictic regimes. Here, we take a three-fold approach to investigate the impact of salinization on mixing in Lake Mendota and Monona, Wisconsin, USA, by deploying under-ice buoys to record salinity gradients, using an analytical approach to quantify the critical salt threshold that prevents spring mixing, and running an ensemble of vertical one-dimensional hydrodynamic lake models (GLM, GOTM and Simstrat) to investigate the long-term impact of salt loading on mixing and stratification. We found that at ice-off both lakes have an EC gradient between surface and bottom waters that persists up to a month after ice-off, and that theory predicts a salinity gradient of 1.3-1.4 g kg-1 would prevent spring mixing. Numerical models project that salt loading delays spring mixing and increases water column stability, with ramifications for oxygenation of bottom waters and lake habitability. |
| **Keywords** | Lake Mendota; Lake Monona; Salinization; Freshwater lake; Lake modeling; GLM; GOTM; Simstrat |
| **Lead author for the dataset** | Robert Ladwig |
| **Title and position of lead author** | Post-Doctoral Researcher |
| **Organization and address of lead author** | Center for Limnology, University of Wisconsin-Madison, 680 N. Park Street, Madison, 53706 WI, USA |
| **Email address of lead author** | rladwig2@wisc.edu |
| **Additional authors or contributors to the dataset** | Linnea Rock, Hilary A. Dugan |
| **Organization associated with the data** | Center for Limnology, University of Wisconsin-Madison |
| **Funding** | United States National Science Foundation ABI development grant (#DBI 1759865) |
| **License** | GPL-2.0 License |
| **Geographic location – verbal description** | Lake Mendota and Lake Monona in Dane County, WI, USA |
| **Geographic coverage bounding coordinates** | Mendota: -89.405, 43.099  Monona: -89.361, 43.063 |
| **Time frame - Begin date** | 1995-01-01 |
| **Time frame - End date** | 2015-31-12 |
| **General study design** | Three-fold approach to investigate the impact of salinization on mixing in Lake Mendota and Monona, Wisconsin, USA, by deploying under-ice buoys to record salinity gradients, using an analytical approach to quantify the critical salt threshold that prevents spring mixing, and running an ensemble of vertical one-dimensional hydrodynamic lake models (GLM, GOTM and Simstrat) to investigate the long-term impact of salt loading on mixing and stratification. |
| **Methods description** | HOBO electrical conductivity loggers on under-ice buoys for conductivity monitoring. Numerical solution by running the LakeEnsemblR-package in R using GLM, GOTM and Simstrat an 1D vertical hydrodynamic ensemble members. |
| **Laboratory, field, or other analytical methods** | HOBO electrical conductivity loggers on under-ice buoys for conductivity monitoring. Deployment happened prior to ice-on and retrieval occurred soon after ice-off. First surface logger at approx. 1 m below surface, and second logger at 1 m from the lake bottom. |
| **Taxonomic species or groups** | - |
| **Quality control** | Electrical conductivity data were calibrated using in-situ absolute electrical conductivity measurements |
| **Additional information** | - |
|  |  |

**Table 2.** Data dictionary: description of the variables (i.e., columns) in EACH dataset. You must provide sufficient detail for another user to understand and use the data. If there are 10 variables (i.e., columns) in the dataset, then there should be 10 rows in this table that describe each column. Be sure to include all relevant information for your dataset, including the unique identifiers for your dataset or system, dates, replicate numbers, latitude and longitude of sampling locations, etc.

Dataset filename: */analytical/[lake\_id]\_bathymetry.csv*

Dataset description: *Bathymetry data (area over depth data)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| Depth\_meter | Depth from the surface | m | - | Integer | NA |
| Area\_meterSquared | Area | m squared | - | Double | NA |

Dataset filename: */chlorideData/Lake[lake\_id]\_Dane\_WI\_VIII.csv*

Dataset description: *Observed chloride data*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| Organization | Organization who monitored data | - | CiteofMadison refers to sampling by Madison city officials; Richard C. Lathrop refers to sampling done by Richard C. Lathrop (DNR); Wisconsin Department of Natural Resources refers to sampling done by the WI DNR; LTER refers to sampling done by UW-Madison | String | NA |
| Station.ID | Sampling station identification | - | CityofMadison refers to sampling site by City of Madison, WI\_DNR and WIDNR-WQX refer to DNR sampling site; LTER refers to UW-Madison sampling site | String | NA |
| Sample.Date | Sampling Date | YYYY-MM-DD | - | Date format | NA |
| Sample.Depth | Sampling depth from the surface | m | - | Integer | NA |
| Sodium | Sodium concentration | mg per liter | - | Double | NA |
| Chloride | Chloride concentration | mg per liter | - | Double | NA |
| Sulfate | Sulfate concentration | mg per liter | - | Double | NA |

Dataset filename: */data/ntl\_icedatescombo.csv*

Dataset description: *Ice data for NTL-LTER lakes*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| year | Year | YYYY | - | Date format | NA |
| lakeid | Identification letter of NTL-LTER study site | - | ME – Mendota, MO - Monona | Character | NA |
| ice\_duration | Duration of ice cover for that winter period | days | - | Integer | NA |
| firstice | Date of ice-on date | YYYY-MM-DD | - | Date format | NA |
| lastice | Date of ice-breakup date | YYYY-MM-DD | - | Date format | NA |
| firsticeYDAY | Date of ice-on date | Day of the year | - | Integer | NA |
| lasticeYDAY | Date of ice-breakup date | Day of the year | - | Integer | NA |

Dataset filename: */data/USWOOO14837\_DaneCountyAirport.csv*

Dataset description: *Meteorological data from Dane County Airport*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| STATION | Year | YYYY | - | Date format | NA |
| NAME | Identification letter of NTL-LTER study site | - | ME – Mendota, MO - Monona | Character | NA |
| LATITUDE | Duration of ice cover for that winter period | days | - | Integer | NA |
| LONGITUDE | Date of ice-on date | YYYY-MM-DD | - | Date format | NA |
| ELEVATION | Date of ice-breakup date | YYYY-MM-DD | - | Date format | NA |
| DATE | Date of ice-on date | Day of the year | - | Integer | NA |
| AWND | Date of ice-breakup date | Day of the year | - | Integer | NA |
| PGTM |  |  |  |  |  |
| PRCP |  |  |  |  |  |
| SNOW |  |  |  |  |  |
| SNWD |  |  |  |  |  |
| TAVG |  |  |  |  |  |
| TMAX |  |  |  |  |  |
| TMIN |  |  |  |  |  |
| WDF2 |  |  |  |  |  |
| WDF5 |  |  |  |  |  |
| WSF2 |  |  |  |  |  |
| WSF5 |  |  |  |  |  |

Dataset filename: */fieldmonitoring/[lake\_id]\_[layer]\_[time].csv*

Dataset description: *Bathymetry data (area over depth data); here ME refers to Mendota, MO to Monona; and EPI to epilimnion, HYPO to hypolimnion*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| # | Number of sequence | - | - | Integer | NA |
| Date | Date | MM-DD-YYYY hh:mm:ss | - | Date-time format | NA |
| Low Range | Electrical conductivity measured on low range (low salinity) | microSiemens per centimer | - | Double | NA |
| Full Range | Electrical conductivity measured on high range (high salinity) | microSiemens per centimer | - | Double | NA |
| Temp | Water temperature | Degree Celsius | - | Double | NA |

Dataset filename: *provide a filename with extension*

Dataset description: *explain what is in this dataset*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Column name** | **Description** | **Units** | **Code explanation** | **Data format** | **Missing data code** |
| *The name of the variable in the dataset; avoid special characters, dashes and spaces* | *A detailed description of the variable* | *Units the variable is measured in* | *If you use codes in your column, please explain each code, such as: LR = Little Rock Lake; A=sample; etc.* | *State exactly how the data are stored; for dates, state how it is formatted, including time zone, etc.* | *If data are missing, indicate how they are stored, such as NULL, NA, blank cell, etc.* |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Table 3. Data provenance**

If you used data derived from other sources, provide the information here so future users know where the data came from.

|  |  |  |  |
| --- | --- | --- | --- |
| **Dataset title** | **Dataset DOI or URL** | **Creator (name & email)** | **Contact (name & email)** |
|  |  |  |  |
|  |  |  |  |

**Scripts/code (software) –** *OPTIONAL*

It is recommended that you also provide your scripts along with your data, although it is not required at this time in our journal.

|  |  |  |
| --- | --- | --- |
| **File name** | **Description** | **Scripting language** |
|  |  |  |
|  |  |  |

**Notes and Comments:**

1. *This document liberally borrows from a similar document provided by the Environmental Data Initiative* [↑](#footnote-ref-1)