**Document Names**

The G-res documents are split into 7 different folders: dataSources, gresInputDataBasicPublic, gresInputDataBasicPublicLanduse, gresInputDataBasicPublicLanduseChem, gresOutputBasicPublic, gresOutputBasicPublicLanduse, gresOutputBasicPublicLanduseChem.

*dataSources*

The dataSources folder holds the documents that contain data that was used to fill in values in G-res.

*gresInputDataBasicPublic*

The gresInputDataBasicPublic folder holds files that can be imported into G-res and contain the following fields of information:

1. Reservoir Area (basic- from an excel data sheet in github)
2. Maximum Depth (basic- from an excel data sheet in github)
3. Reservoir Volume (basic- from an excel data sheet in github)
4. Mean Depth (basic- from an excel data sheet in github)
5. Littoral Area (basic- from an excel data sheet in github)
6. Average Monthly Temperature (publicly available)
7. Annual Wind Speed (publicly available)
8. Global Horizontal Irradiance (publicly available)

*gresInputDataBasicPublicLanduse*

The gresInputDataBasicPublicLanduse folder holds files that can be imported into G-res and contain all of the fields of information included in gresInputDataBasicPublic as well as:

1. Land Use Characteristics
2. Catchment Area
3. Latitude and Longitude of the Lake

*gresInputDataBasicPublicLanduseChem*

The gresInputDataBasicPublicLanduseChem folder holds files that can be imported into G-res and contain all of the fields of information included in gresInputDataBasicPublicLanduse as well as:

1. Mean phosphorus concentration (ug/L)
2. Soil carbon content (gathered with Earth Engine)
3. Percent River Area Pre Impoundment (Which can be calculated from Pre Impoundment River Length, which can be measured in GIS)

*gresOutputBasicPublic*

The gresOutputBasicPublic folder contains the G-res output information when the data from gresInputDataBasicPublic is imported.

*gresOutputBasicPublicLanduse*

The gresOutputBasicPublicLanduse folder contains the G-res output information when the data from gresInputDataBasicPublicLanduse is imported. The output values are the exact same as the gresOutputBasicPublic files.

*gresOutputBasicPublicLanduseChem*

The gresOutputBasicPublicLanduseChem folder contains the G-res output information when the data from gresInputDataBasicPublicLanduseChem is imported.

**Input Variable Information**

*Basic:*

*Excel Data:* If you input the Basic data (from the dataForGres excel file in jbeaulie/gres github), G-res calculates 0 values for Emission Rate (tCO2e/yr) of which CH4 and Emission Rate (gCO2e/m2/yr) and Emission Rate (gCO2e/m2/yr) of which CH4. It does not make calculations for the “Relative contribution to CH4 Post-Impoundment Emissions” section (which includes “Fraction of CH4 diffusive flux from Total Reservoir CH4 Emission (%)”, “Fraction of Degassing of CH4 from Total Reservoir CH4 Emissions (%)”, and “Fraction of Bubbling of CH4 from Total Reservoir CH4 Emission (%)”.

*Publicly Available:*

*Temperature Data:* If you input Temperature data into G-res, it calculates nonzero values for the fields listed above. However, they seem to be off and it calculates the “Relative contribution to CH4 Post-Impoundment Emissions” to be 100% diffusive flux and 0% bubbling.

*Wind Data:* If you input wind data into G-res, it does not change the numbers calculated from the excel and temperature data, but it does allow G-res to calculate the thermocline. G-res does not seem to be very sensitive to this value.

*Mean Global Horizontal Irradiance Data:* If you input mean global horizontal irradiance data into G-res, it calculates different numbers than it did just using the variables mentioned above (excel, temperature, wind). It also calculates the “Relative contribution to CH4 Post-Impoundment Emissions” as nonzero values for both diffusive flux and bubbling. Without water level data (and thermocline data), G-res considers degassing to be 0%.

*Land Use:*

*Land Use Data:* If you input land use data, the reservoir GHG output calculations do not change from the values calculated using excel and publicly available data.

**G-res Variable Notes**

*Sensitivity Tests*

Mean global horizontal irradiance: sensitive to small changes. This variable is important in determining relative contribution of ebullition.

Annual wind speed: not sensitive to small changes. This variable is important in determining the thermocline.

*Sources*

<https://windexchange.energy.gov/maps-data/215> (wind map of Ohio)

<http://w2.weather.gov/climate/index.php?wfo=iln> (National Weather Service has wind data)

<https://gis.ncdc.noaa.gov/maps/clim/> (temperature data)

<https://www.nrel.gov/gis/data.html> (global horizontal radiance data)

<https://www.ncdc.noaa.gov/cdo-web/datasets> (possible wind 🡺 Local Climatological Data 🡺 Mapping tool 🡺 <https://gis.ncdc.noaa.gov/maps/ncei/lcd>

\*\*Note: when you use the wind data from the wind sources listed and use the equation given my G-res in the user guide to calculate the wind at 10m, the numbers come out weird.

*Other Notes*

Land Use: in the ohio2016SampleFrameTable.xls file, the variable names and what they translate to in G-res are:

|  |  |  |
| --- | --- | --- |
| **Excel Variable Name** | **Translation** | **G-res Variable Name** |
| watershed\_ | Watershed area in m2 | Catchment Area (km2) |
| Percent\_op | Percent open water | Water Bodies (%) |
| Percent\_ur | Percent urban | Settlements (%) |
| Percent\_we | Percent wetland | Wetlands (%) |
| Percent\_gr | Percent grasslands | Grassland/Shrubland (%) |
| Percent\_ag | Percent agriculture (percent\_pa + percent\_cu = percent pasture + percent cultivated = percent\_ag) | Croplands (%) |

**Technical Notes**

* Sometimes when you input a value into G-res, a question mark is portrayed instead of the value. This is okay and G-res still has the value.
* When you input a value to a red box, it will turn white (so if a box is white and has a value in it, that does not mean that it was not a “necessary” value).

**R scripts**

*dataSourceLocations.R*

* Contains notes about the process of inputting variables to G-res and output variables
* Contains paths to all of the data sources (as they were in my O:drive- they should all be in github)
* Reads in excel files with data

*annualizeEmissions.R*

* This file calculates the annualization coefficient (with notes about the reasoning), and reads in the excel file with all of the measured data and applies this annualization coefficient to it. It then reads in the excel file with the G-res predicted values, and merges the file with the measured data with the file with the G-res predicted values. It makes graphs comparing these values.

**Using Earth Engine**

*How to convert GIS shapefiles into KML*

<https://support.esri.com/en/technical-article/000012399>

*Elevation (meters above sea level) Data:*

https://water.usgs.gov/osw/streamstats/

To use Earth Engine, you need to use the KML to create a fusion table. Then you paste the ID of the fusion table into the code, edit the elevation, put a point on the map where the dam is, and click run. If you don’t put the point in the correct spot, the tool won’t run properly and you will have to fix it. This will give you all the data you need. All of the fusion tables and output data can be saved in google drive.

\*\*\*\*\*\*There is also a detailed explanation of what I did in dataSourceLocations.R in the scripts folder in github