**Jacob Wynne Prospectus Outline**

1. Download the following EWEMBI corrected ISIMIP models: MIROC5, IPSL-CM5A-LR, GFDL-ESM2M, HADGEM2-ES under RCP 8.5 conditions.
2. Download the needed Sunapee data for LER including meteorology, discharge, water temperature, hypsography. In this context, EWEMBI will be used in place of the on-site meteorology data.
3. Ensure that all models run on LER using base parameters. This is vital for comparative analyses later on.
4. Once all models run, calibrate parameters for LER using a specific set of years in the historical dataset. First choice of calibration method is MCMC so that there are understandable distributions to work with.
5. When parameters are calibrated and RMSE values are down, LER \*should\* be able to work with the ISIMIP models.
6. Force the ISIMIP models into LER and produce results for all LER models up to 2099.
7. Once results are produced, look at all outputs of LER with emphasis on temperature profile. For example, stratification duration during summer months should be an interesting variable to look at.
8. Once specific values have been processed for each model, a comparative analysis between all LER models should be carried out.
9. The comparative analysis will revolve around the spread and difference of values between the LER models.

Possibilities:

* Mean stratification duration by year with 95% confidence intervals for each LER model up to 2099. Track the average change from year to year for each model.
* Difference between surface and bottom temperature up to 2099 for each LER model. Would give more insight into the magnitude of the stratification according to each model. Unsure of how uncertainty could be quantified in this case.
* Compare water temperature per meter (0-33m), averaged yearly with a 95% confidence interval. Would give a better insight into differences in modeling the entire water column for the LER models. Maybe some models are better at upper column, middle column, lower column?

1. Move on to uncertainty partitioning.

**Uncertainty Partitioning**

1. Climate model uncertainty: Use median parameter values; Do not propagate process uncertainty; Uncertainty is defined as the width of the 95% CI of percent change in stratification duration from 2021 (ish) up to 2099.
2. Parameter uncertainty: Sample from the posterior distributions of the parameter sets; Generate separate ensembles for each climate model and calculate uncertainty by taking the width of the 95% CI of ensembles averaged across the climate models.
3. Ecosystem Model process uncertainty: Comparing different outputs using sampled parameters and using an ensemble approach; Take the width of the 95% CI averaged across models.
4. Total forecast uncertainty: propagate from previous three.
5. Climate scenario uncertainty: Difference in percent change of temperature from different climate model scenarios (RCP 4.5, RCP 8.5) using the anomaly values produced by combining LER and ISIMIP models.