Linking CE-QUAL-W2 with SWAT

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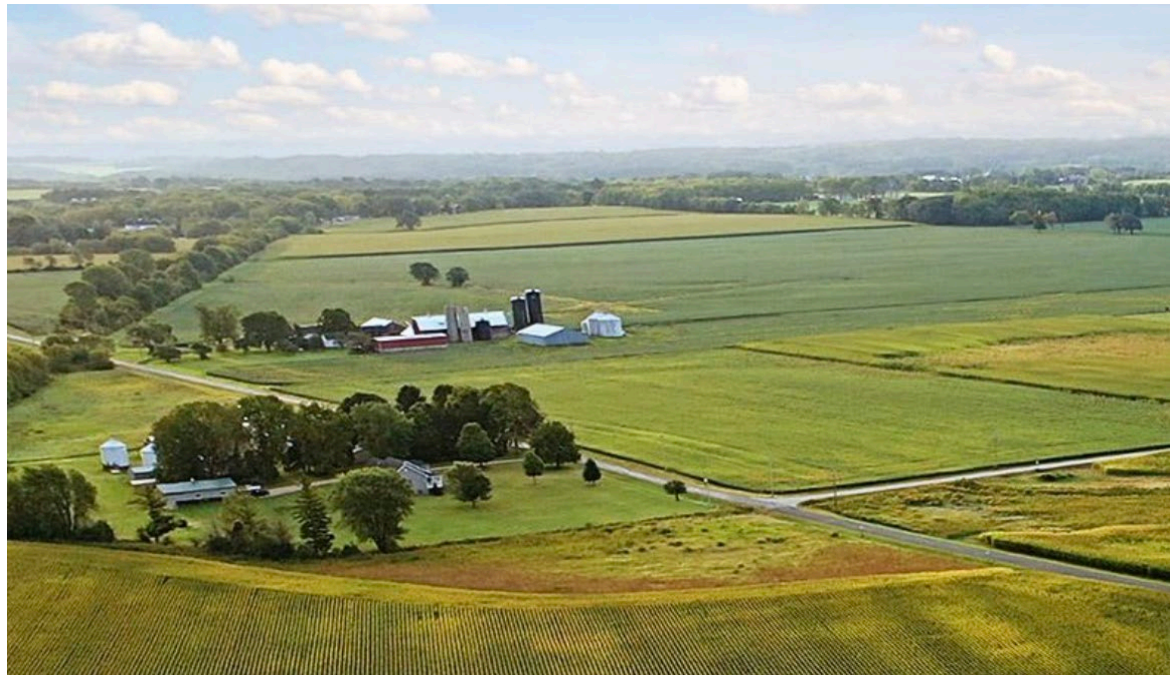

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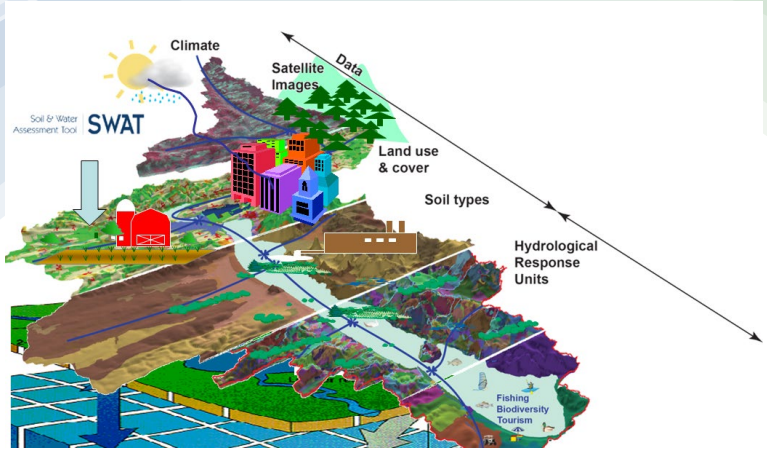
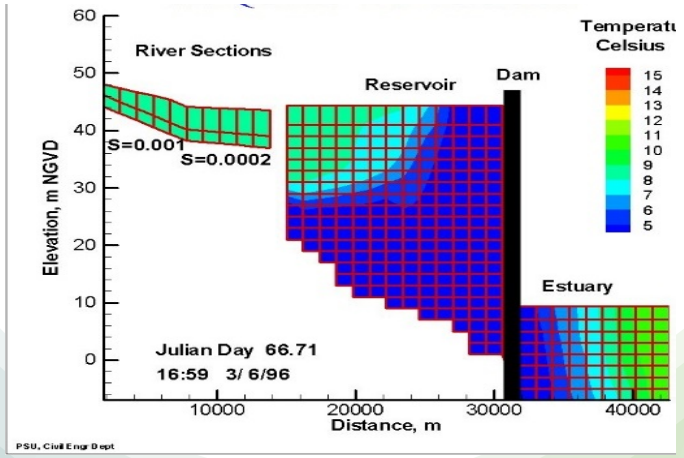
General Steps To Linking

- Determine the specific variables and processes that could be connected between the CE-QUAL W2 and SWAT models. For example, the concept of linking water quality parameters from CE-QUAL W2 to the hydrologic processes found in SWAT.
- Assess the compatibility of the data used by both models. The link needs to identify pertinent input data from SWAT that can be used as input to W2. Develop the required data into a compatible format for both models.
- Perform any necessary data preprocessing to ensure compatibility between the models. This concept could involve reformatting and/or transforming the data to match the requirements of each model. NOTE: There could be temporal and spatial differences with the data. This concept could aid in determining appropriate agreement for the linkage.
- Create a mechanism for data exchange between the models. This concept will involve creating scripts/code/wrappers that facilitate the transfer of data between CE-QUAL W2 and SWAT.





Variables to Consider?

- Water quality parameters – There are many water quality parameters to consider between the models. Main ones such as temperature, dissolved oxygen (DO), pH, turbidity, chlorophyll-a, and other main constituents need to be linked.

- Land use and land cover - Linking land use and land cover information between CE-QUAL W2 and SWAT enables the assessment of the impacts of land management practices with respect to water quality. This concept will involve exchanging land use maps, associated management practices, and other such variables.

- Point source inputs – Linking point source inputs, such as wastewater discharges, industrial effluents, or other point sources these inputs allow for the consideration of localized pollution sources in the water quality simulations.

SWAT Soil & Wate
Assessmen

SWAT flow variables
to
Transfer to W2

SWAT
- QIN
- CIN
- PRE

W2
- flo_out
- sed_stor/out (Qs)
- precip

SWAT Soil & Wate
Assessmen

SWAT Sediment to Transfer to W2

SWAT

- sed (Total Sediment Yield)
- Organic Matter

W2

- Need to implement Inorganic Sediments into W2
- Organic Matter

SWAT Soil & Wate Assessmen

Water Quality and Meteorological Variables

SWAT
- Solar Radiation
- Dew Point Temperature
- CHLA
- DO

W2
- SOLARAV(MON)
- DEWPT(MON)
- chla_stor
- dox_out

SWAT Soil & Wate Assessmen

Water Quality
Total Nitrogen,
Organic Nitrogen,
Nitrate, etc.

SWAT

- Nitrogen Species (NH4, NOx, TN)
- Phosphorus Species (Org, Inorg)
- Carbon Species (Org, Inorg)

W2

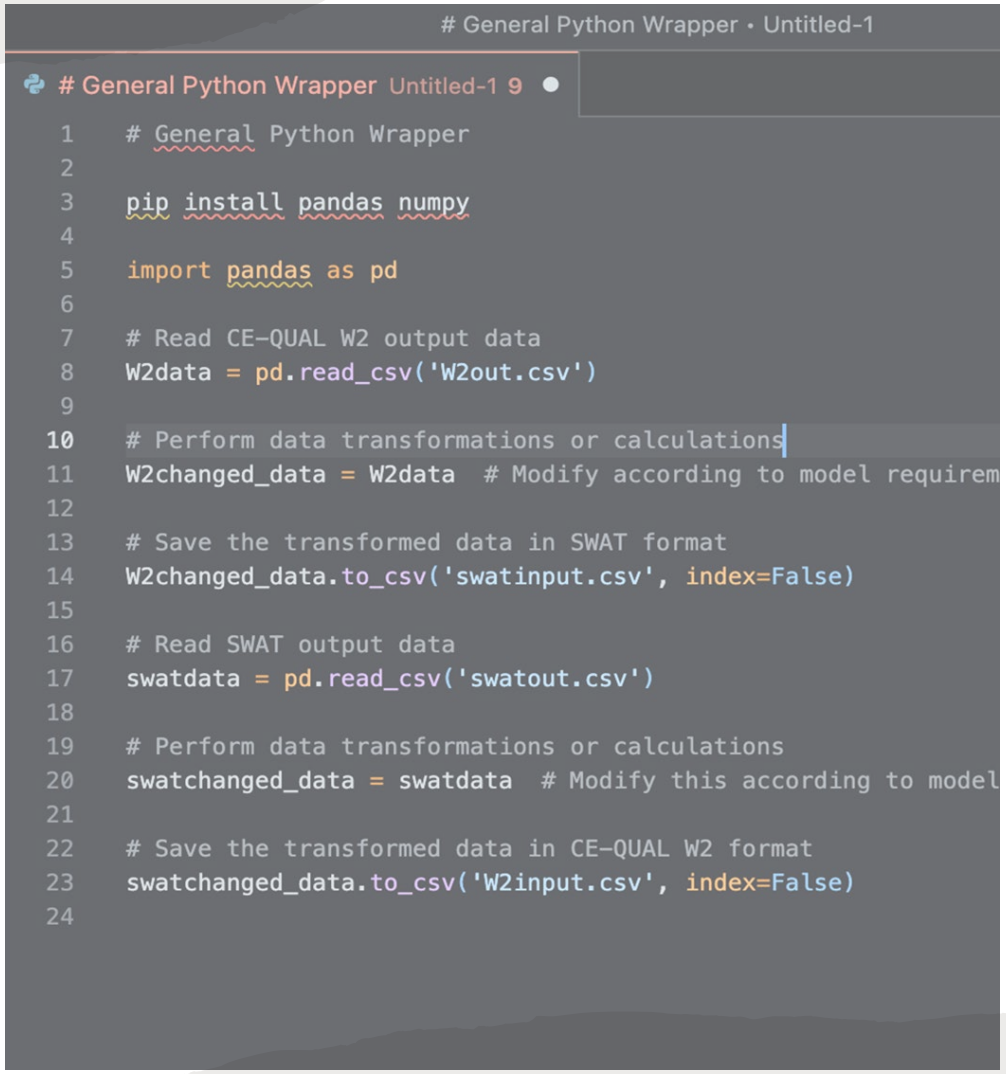
- Nitrogen Species (NH4, NOx, TN)
- Phosphorus Species (Org, Inorg)
- Carbon Species (Org, Inorg)

Variable Linkage to SWAT

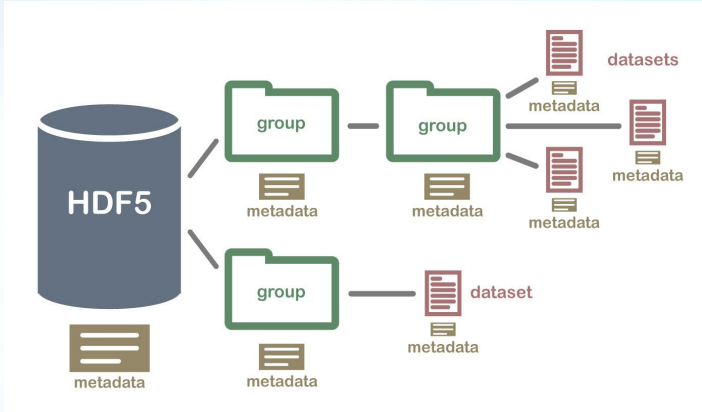
Some of the SWAT and CE-QUAL W2 variables are listed or developed differently.

There are SWAT output variables that may need to be transformed for reading into CE-QUAL simulations.

The transformations may be developed in a Python wrapper.

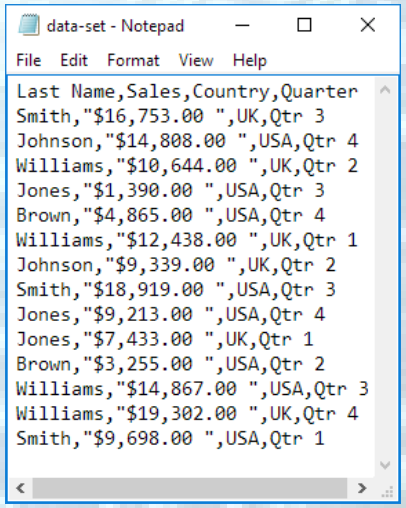


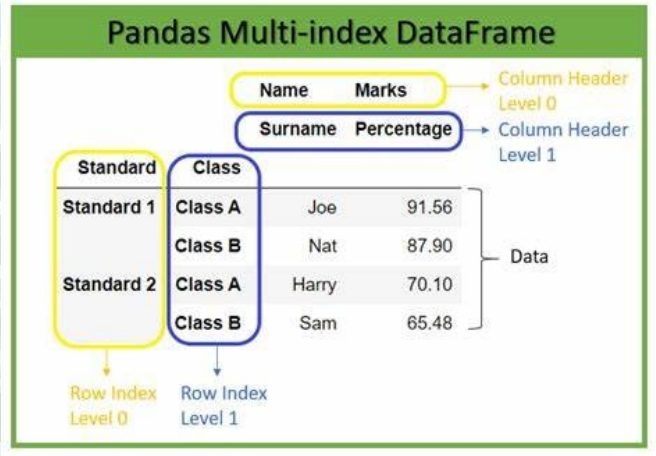
Data Storage and Transfer between SWAT and CEQUAL-W2



Will evaluate how each model stores input and output data in an effort to more efficiently transfer information between the two modeling systems. Recommendations will be made for improved data storage and transfer methods if need be:

- Comma Separated Values (CSV)
- HDF5
- Pandas Dataframes
- etc

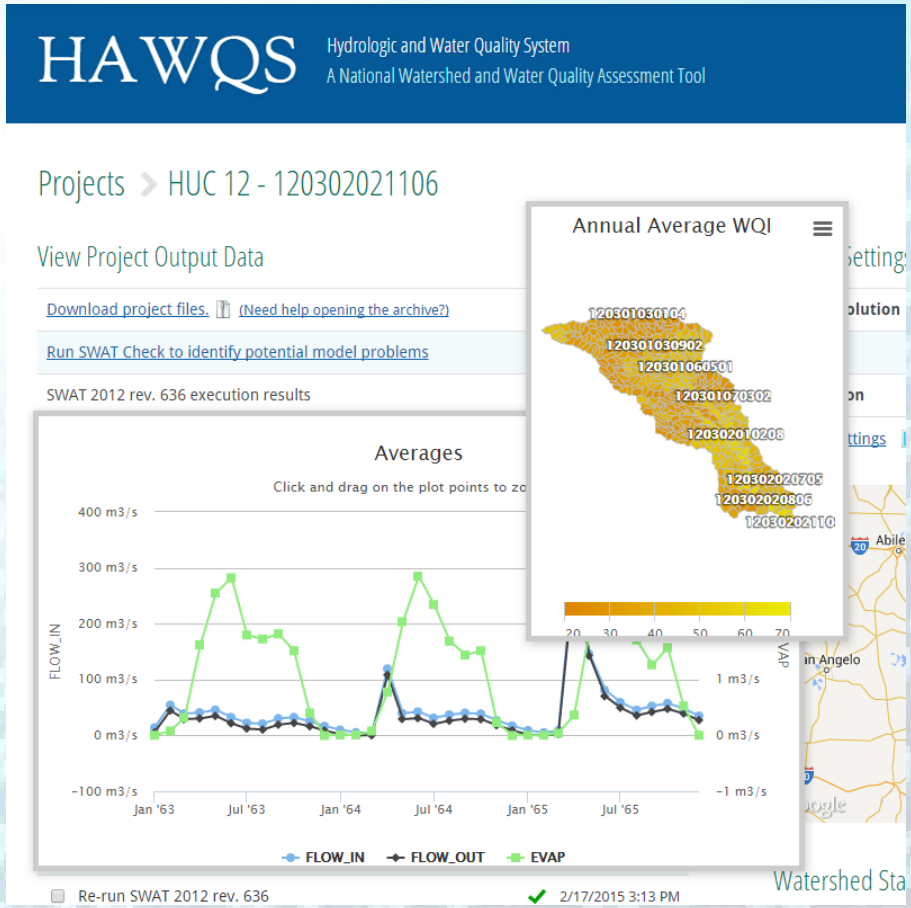




HAWQS

HAWQS substantially enhances the usability of SWAT to simulate the effects of management practices based on an extensive array of crops, soils, natural vegetation types, land uses, and other scenarios for hydrology and the following water quality parameters:

- Sediment
- Pathogens
- Nutrients
- Biological oxygen demand
- Dissolved oxygen
- Pesticides
- Water temperature



Provide CEQUAL-W2 capabilities within HAWQS in order to facilitate SWAT and CEQUAL-W2 linkage.


Questions?