Energy Research and Development Division
FINAL PROJECT REPORT

# MODELING TOOL TO ASSESS AND MITIGATE THE EFFECTS OF SMALL HYDROPOWER ON STREAM FISHES IN CHANGING CALIFORNIA CLIMATE

## Appendix B: User's Manual for Middle Ware [Master_WEAPhish]

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# User's Manual for Middle-Ware [Master_WEAPhish]

## 1. What is Master_WEAPhish

In this collaborative project we linked a water resources model (WEAP) and a fish population model (WEAPhish, scripted in Python), through the new middle-ware called Master_WEAPhish (scripted in Visual Basic for Applications (VBA) in Excel). The advantages of using this middle-ware are: (1) it easily automates repetitive processes (2) it is convenient to store inputs and outputs in the same file location, and (3) the user can adjust more than one parameter per run.

## 2. How to set up WEAPhish

In the process, the middle-ware "Master_WEAPhish" Excel file is located in directory C:\WEAPhish. This excel file is saved as an "Excel Macro-Enabled Workbook" and should be saved in this format all the time.

A. The Developer tab is not displayed by default. For those users who have not used VBA in Excel before, please follow these extra steps:

Click on File menu and select "Options" at the end of the menu. In the new window that pops up, click on "Customize Ribbon" and check the option labeled "Developer" on the right hand pane. Click OK. Now the Developer tab will be on the ribbon interface.

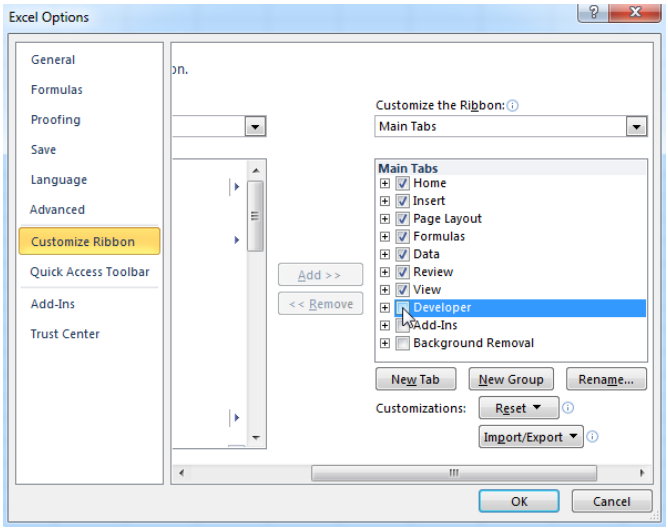



**Figure 1.** Excel Option window where user can select Developer. The Developer tab allows the user to view the VBA code and all built macros in Master_WEAPhish. If the macro does not run, this step is crucial. Also, the user should double check that it is saved as a "Macro-enabled workbook".

B. Sometimes, the macro function is not displayed by default. For those users who have not used VBA in Excel before, please follow the extra steps:

Click the Microsoft Office Button, and then click Excel Options. Click Trust Center, click Trust Center Setting, and then click Macro Settings. Then, Click the option “Enable all macros (not recommended; potentially dangerous code can run)”.

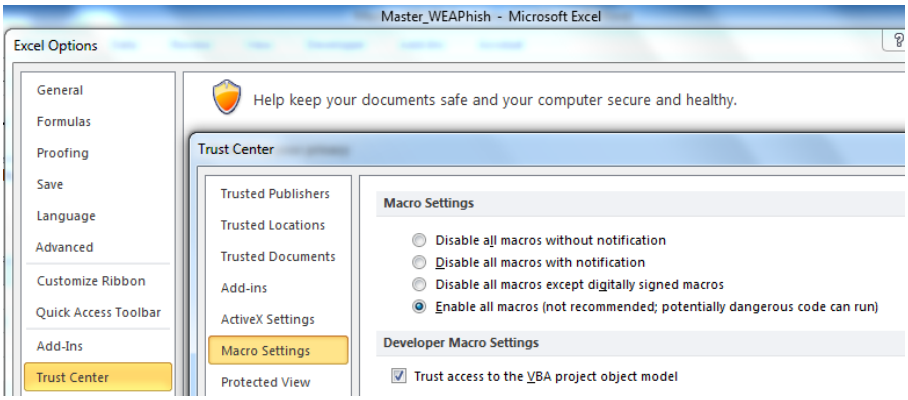



**Figure 2.** Another important set up before running Master_WEAPhish. If user has never used a macro on a particular computer, it is very likely that the user will need to set this up as well.

## 3. How to set up sub-folders

Before, running the WEAP and WEAPhish “main_fish.python” files using Master_WEAPhish, the sub folder needs to be in the correct place from which to run. Download the WEAPhish.zip file and unzip it in directory “C:\”. Then the unzipped files in Local C should look like the following:

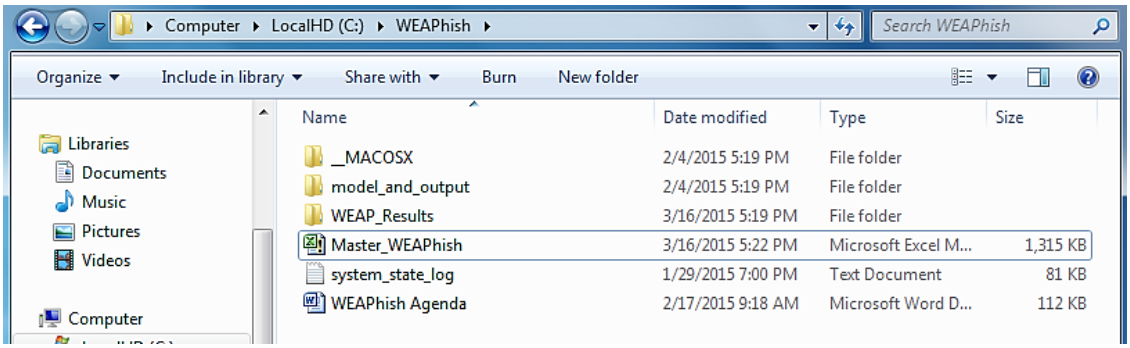



**Figure 3.** How unzipped WEAPhish.zip file should appear in Local Drive C. Do not change/remove these files to a different directory. These need to stay in this specific location. Instead of WEAPhish_Agenda, it will be updated as a Master_WEAPhish_manual word document.

## 4. Download WEAP, Anaconda, and Python 27

Go to the following link, register as a "member" (free), and download the most up-to-date version of WEAP.

http://www.weap21.org/

After the WEAP installation, it will automatically set up the WEAP area in directory "C:\Users\User's name\Documents\WEAP Areas". Remember to move the unzip file named "WEAP:2015_02_04_BUT_BAU". Open WEAP, in Schematic view, go to Area tab, go to Manage Areas, press the button Restore, and select the correct unzipped area file (User does not have to unzip the Area file).

For Anaconda, no registration is required, so follow the link and download it (check whether your computer has Windows 32-Bit or 64-Bit http://continuum.io/downloads

For Python 2.7, no registration is required. When you select the directory to run the installation, use default. https://www.python.org/download/releases/2.7/

## 5. Explanation of each tab

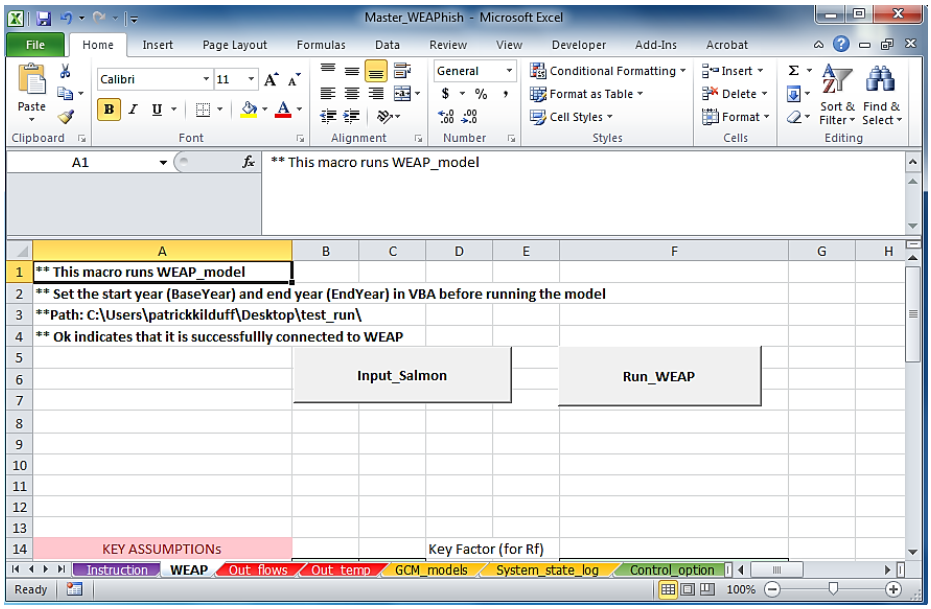



**Figure 4.** In Master_WEAPhish, the "WEAP" tab has two main macros: Input_Salmon and Run_WEAP macro. Other tabs are displayed in different colors.

Detailed information about the content of WEAPhish is provided separately in the WEAPhish User's Manual: A guide to installing and running a habitat-based, fish population model, v. 0.1 manual (Kilduff et al. 2015). This description gives an idea of how to use the available Macros that are available in different tabs.

**Instruction** – Overview of Master_WEAPhish Excel file. No macros in this tab. Read before using Master_WEAPhish.

**WEAP** – this is the main tab that controls the following: running WEAP, running scenarios, updating input data, changing start and end year, and adjusting key assumptions.

***Input_Salmon macro*** this is located on the left top of the worksheet. Click this macro and it will take few seconds to run. No pop up window will be shown. This macro runs all the input value macros from the other tabs. Instead of individually updating the macro, the user can simply click this macro to have all input data updated. However, if the user needs to update an individual input data set, the user can go to an individual input data tab and click the individual macro for update. Then it will not update all input data, only the data associated with the selected macro.

***Key Assumption*** are values directly connected to WEAP, meaning any changes made in Key Assumption values will reflect on the WEAP calculation. It is not recommended that the user adjust these values, unless the user is confident about new Key Assumption values.

***Start_year_and_End_year*** is the tab used to adjust the starting and ending year. This will automatically link to WEAP meaning there is no need for user to go into the WEAP model to adjust this feature.

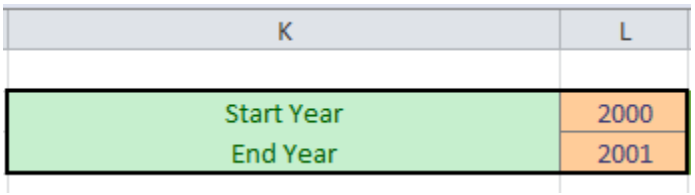



**Figure 5.** Start year and end year can be adjusted in column K and J.

***Run_WEAP macro*** is another macro located next to the Input_Salmon macro. This macro runs the WEAP model. When you click it, the following tab will be shown:

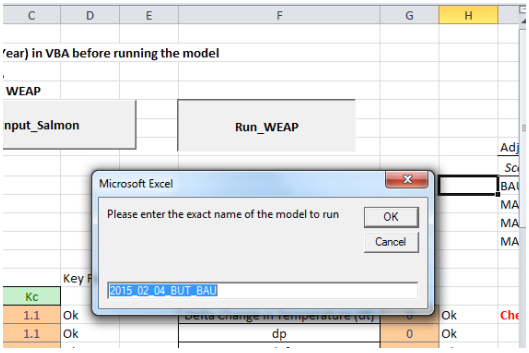
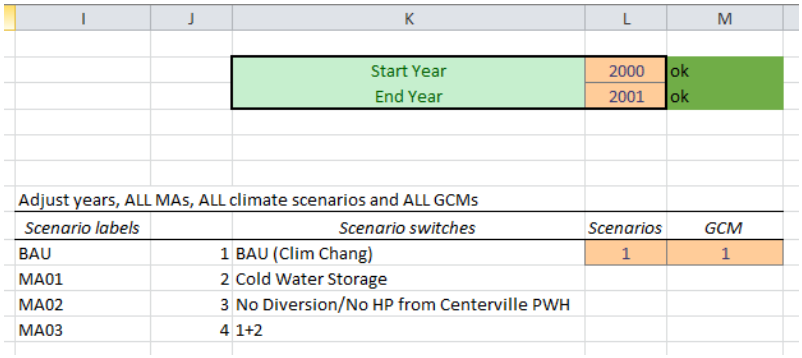



**Figure 6.** The pop up appears when the user clicks on the Run_WEAP macro. It will ask the user which model to run. The user is asked to input the name of the model to run. Please refer to the name of the WEAP model.

After WEAP is done running, the result will be shown in the red tab (i.e. Out_flow, Out_temp). Also some results will be saved in the directory "C:\WEAPhish\WEAP_Results"

***Running Scenarios*** is used to easily adjust the scenario and General Circulation Models (GCM) that the user would like to run. As it is shown in Figure 7, the scenario is controlled in cell "L9" and GCMs is controlled in cell "M9". We have four scenarios available. Plugging in "1" in cell L9 will only run "Business As Usual (BAU)", typing in "2" in cell L9 will run "Cold water Storage" and previous scenario, typing in "3" will run the scenario with "No Diversion/ No hydrologic pump from Centerville PWH" and previous two scenarios, and typing in "4" will run the combination of BAU and Cold Water Storage scenarios and previous three scenarios.



| | I | J | K | L | M |
|---|---|---|---|---|---|
| | | | Start Year | 2000 | ok |
| | | | End Year | 2001 | ok |
| | Adjust years, ALL MAs, ALL climate scenarios and ALL GCMs | | | | |
| | *Scenario labels* | | *Scenario switches* | *Scenarios* | *GCM* |
| | BAU | 1 | BAU (Clim Chang) | 1 | 1 |
| | MA01 | 2 | Cold Water Storage | | |
| | MA02 | 3 | No Diversion/No HP from Centerville PWH | | |
| | MA03 | 4 | 1+2 | | |

**Figure 7.** In the WEAP tab, the user can choose which scenarios and GCM to run. User can type in from 1 to 4 for scenario in cell L9 and can type in from 1 to 12 for GCM in cell M9.

We have twelve GCMs available. User can type in number 1 to 12 in cell M9. The GCM is shown in GCM_models tab. More scenarios and more GCMs will take longer time to run.

**Out_flows** – After WEAP runs, the flow output data is saved in this work sheet.

**Out_temp –** After WEAP runs, the temperature output data is saved in this work sheet.

**GCM_models –** Please do not adjust this work sheet unless the user is confident about it. This may alter the name of the output files. Unless user has a specific reason for adjusting these names, this tab should remain the same.

**System_state_log –** Please do not adjust this work sheet unless the user is confident about it. This may alter the name of the output files. Unless user has a specific reason for adjusting these names, this tab should remain the same.

**Control_option, Control_process, Relations, Spawn, Species_info, Stream, Supplement, Temps, Wua, Wua_stage_scalars**

These tabs include one macro that exports the worksheet data into text file. As shown on the right side of the worksheet, the macro is called, for example, “Control_option.txt”. The text file will be saved in the directory “C:\WEAPhish\model_and_output\bc_2010”.

For further information about Master_WEAPhish or User’s Manual, contact the following:

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