



## Exercise C5 – Modeling Climate Change Impacts Using SWAT and the Climate Assessment Tool

In this exercise, we will use the Climate Assessment Tool (CAT) with an established SWAT simulation to explore a given area's response to climate change.

### Questions addressed in this exercise:

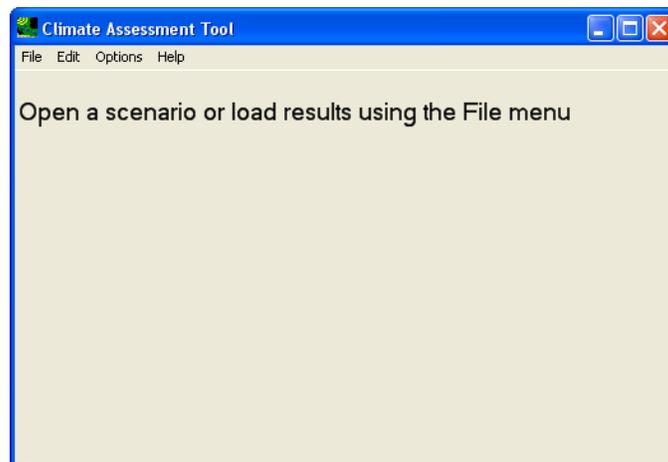
- 1) How do I set up CAT to work with an existing SWAT project?
- 2) How do I create a series of climate change scenarios and choose endpoints?
- 3) How do I conduct batch SWAT simulations for climate change scenarios?

### A. Setting Up CAT To Work With An Existing SWAT Project

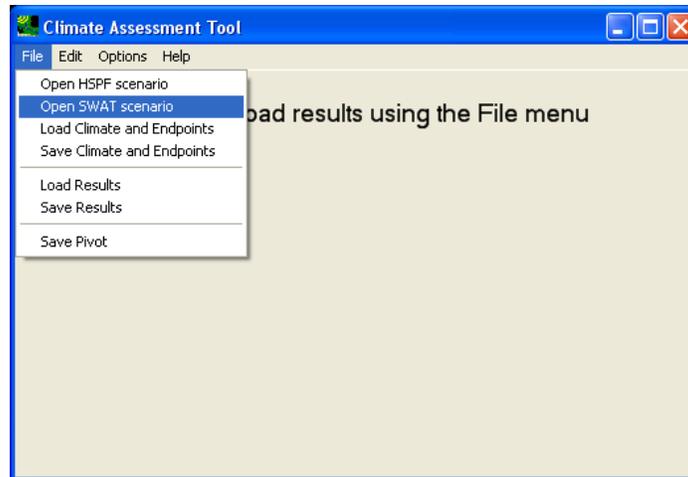
#### QUESTION ANSWERED:

1) *How do I set up CAT to work with an existing SWAT project?*

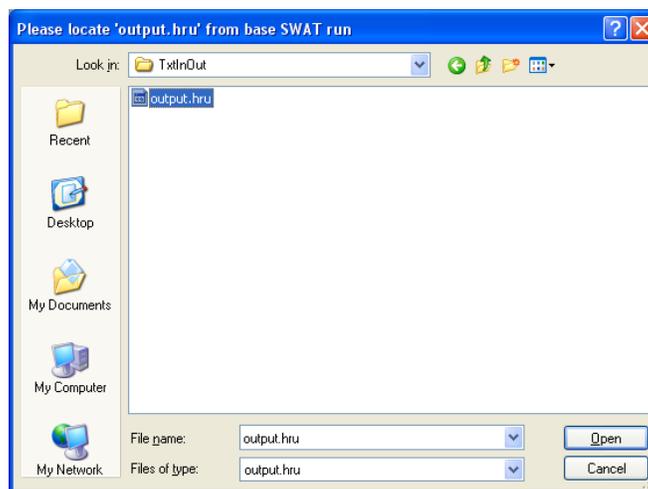
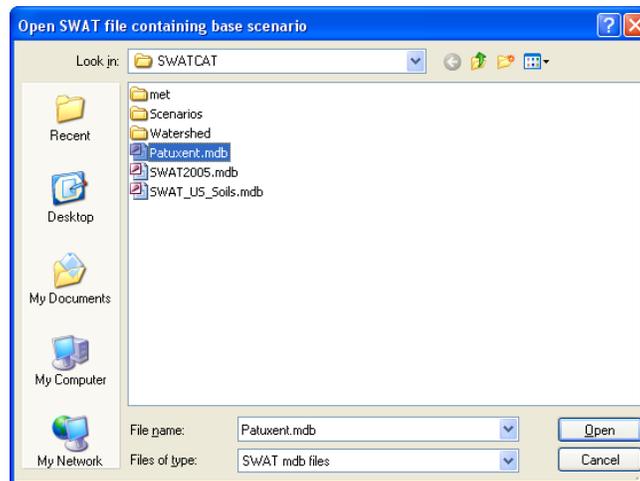
1. Turn on the Climate Assessment Tool (CAT) plug-in and subsequently activate it from the 'Analysis' menu option as shown in CAT Exercise C1. The initial CAT form is shown below.



2. From the **File** menu, select the option **Open SWAT scenario** as shown below:



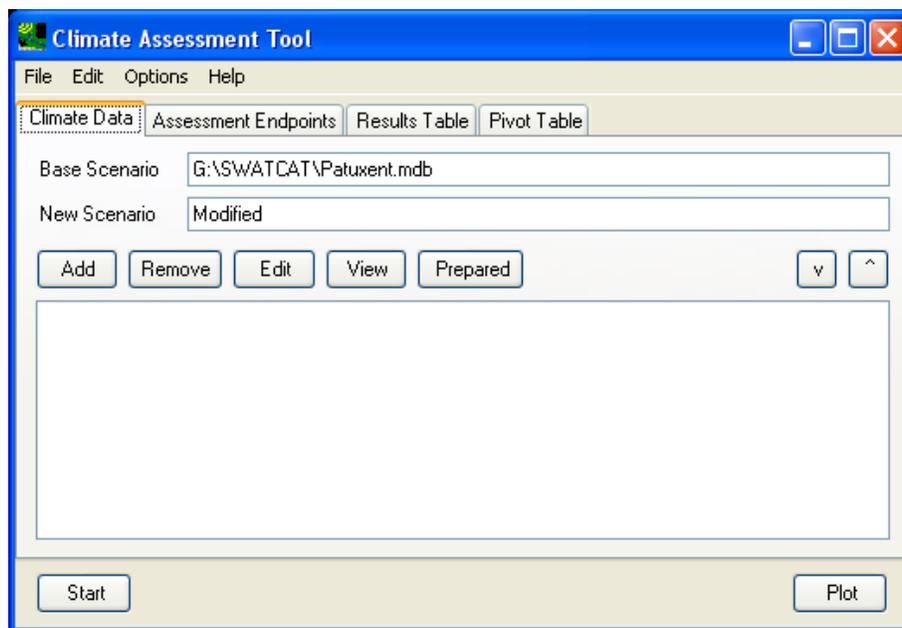
3. Locate the Access *mdb* file for the project, the weather data, and output files for the **base** scenario using the following open file dialog windows as shown below. It is important to know that the base scenario needs to be run prior to any CAT analysis.



The required files and their designated locations are as follows (these files need to be placed as directed below before any CAT analysis):

Project Access <i>mdb</i> file	<CAT DIRECTORY>\Patuxent.mdb
Base run I/O files	<CAT DIRECTORY>\Scenarios\base\TxtInOut
Base weather data	<CAT DIRECTORY>\Scenarios\met\met.wdm
Base run <i>fig,fig</i>	<CAT DIRECTORY>\Scenarios\fig.fig
SWAT Executable	<CAT DIRECTORY>\Scenarios\swat2005.exe
SWAT <i>mdb</i>	<CAT DIRECTORY>\Scenarios\SWAT2005.mdb
SWAT soil <i>mdb</i>	<CAT DIRECTORY>\Scenarios\SWAT_US_Soils.mdb

- Once the required files are located, the initial CAT page will appear as shown below.



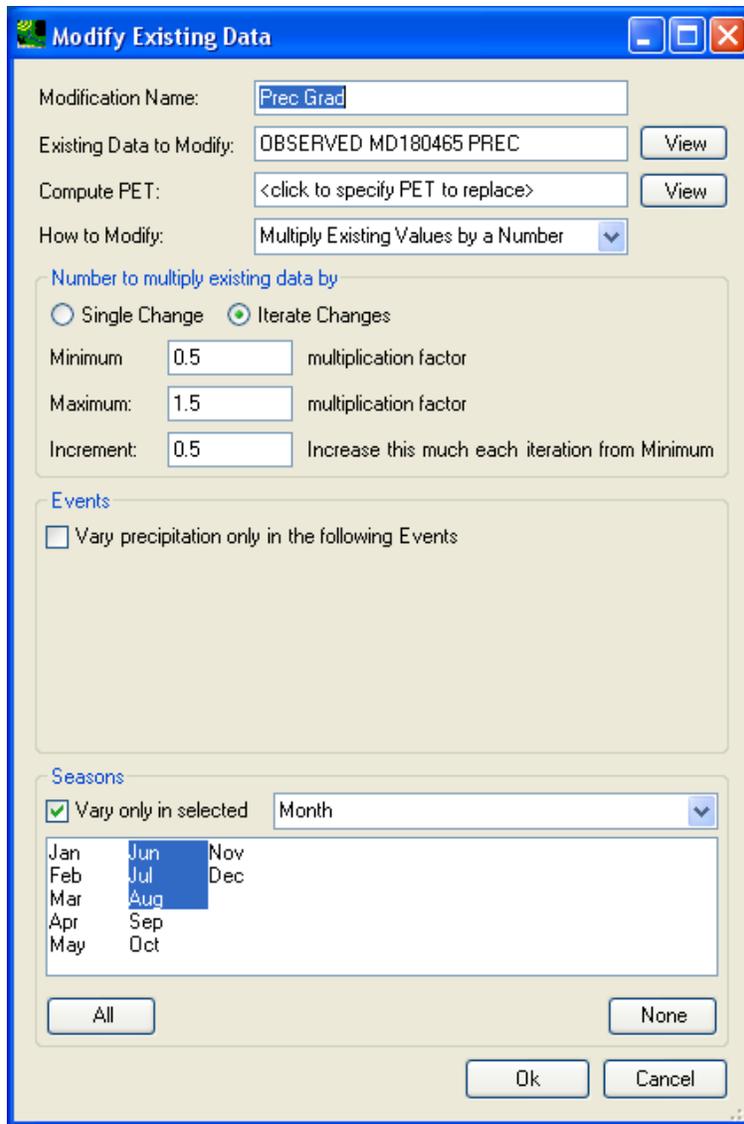
Leave the ‘New Scenario’ name to read ‘Modified’.

## B. Construct Climate Change Scenarios

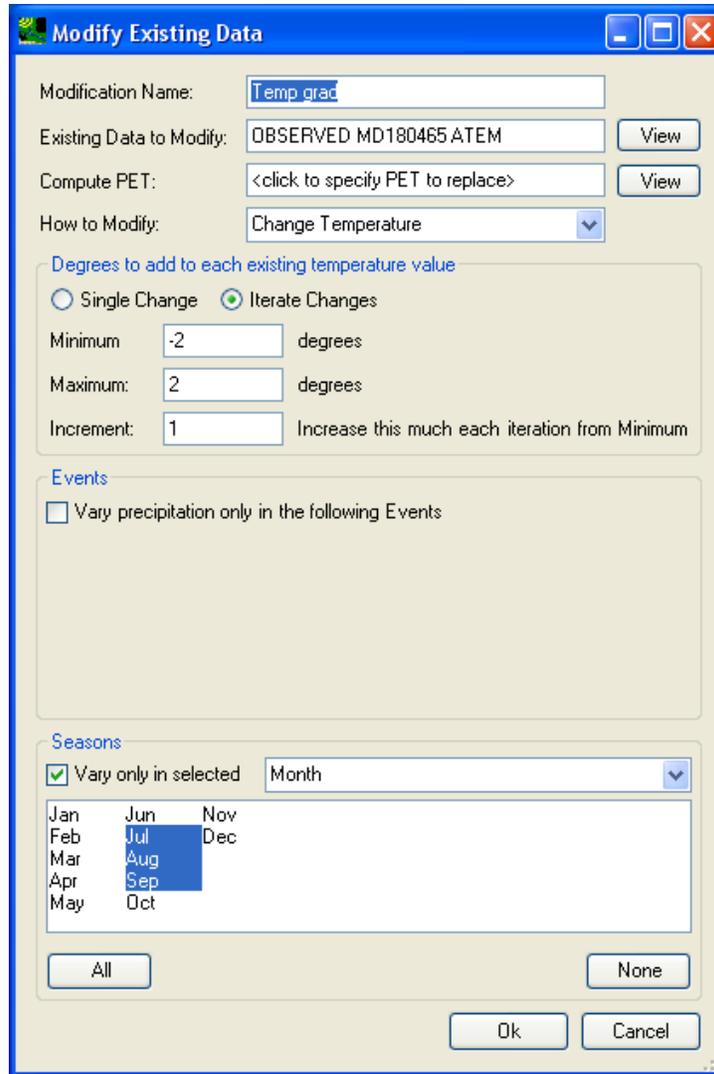
*QUESTION ANSWERED:*

2) How do I create a series of climate change scenarios and choose endpoints?

- Click the ‘Add’ button on the ‘Climate Data’ Tab to bring up the ‘Modify Existing Data’ dialog window and specify all required information as shown below:

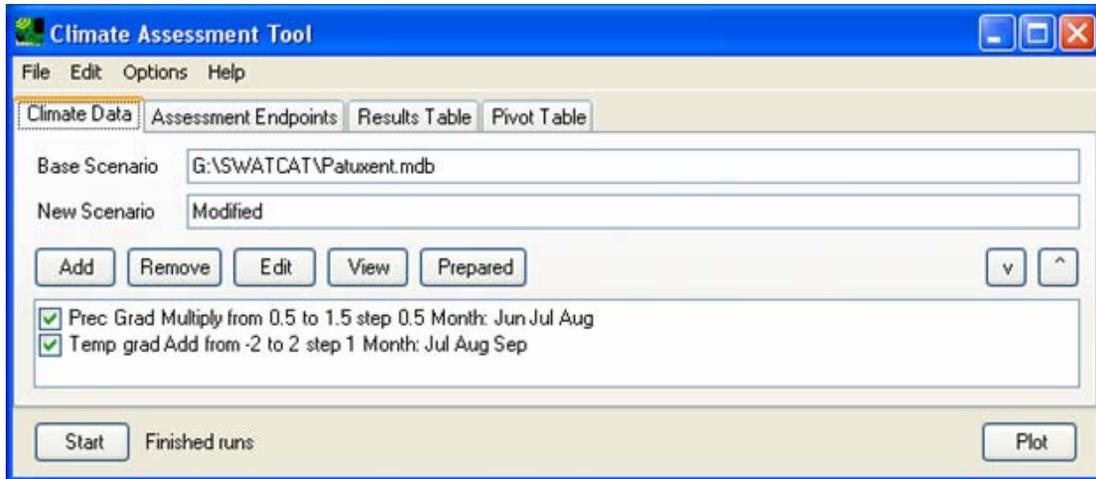


2. Click 'Ok' button to save this climate change definition for later use.
3. Click 'Add' button again to initiate the definition of another climate change scenario for temperature. Specify all information as shown below:



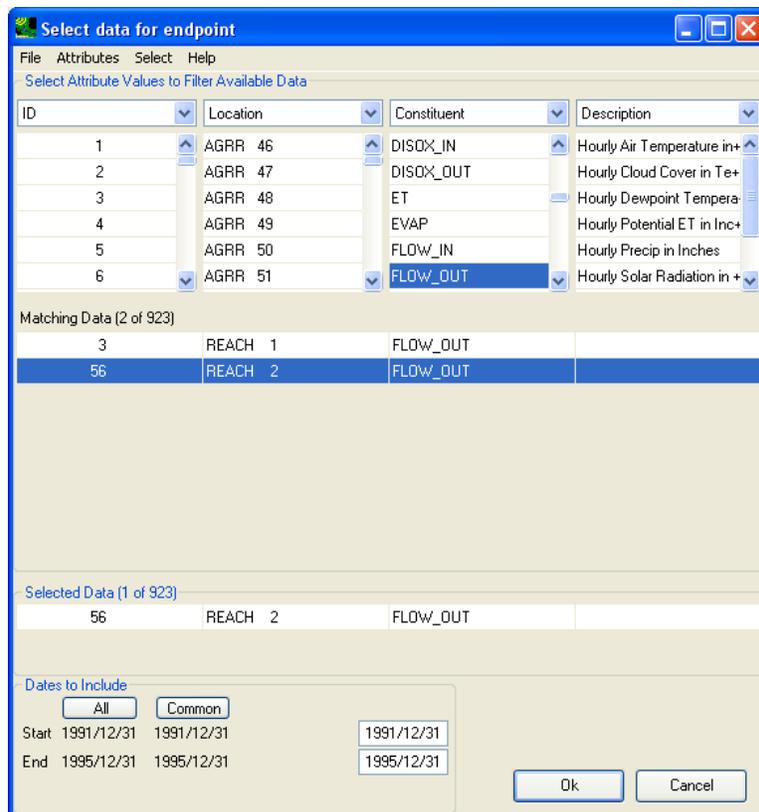
4. Click the 'Ok' button to save this definition for later use.

At this point you have defined two gradient change schemes for both precipitation and temperature, as shown below:

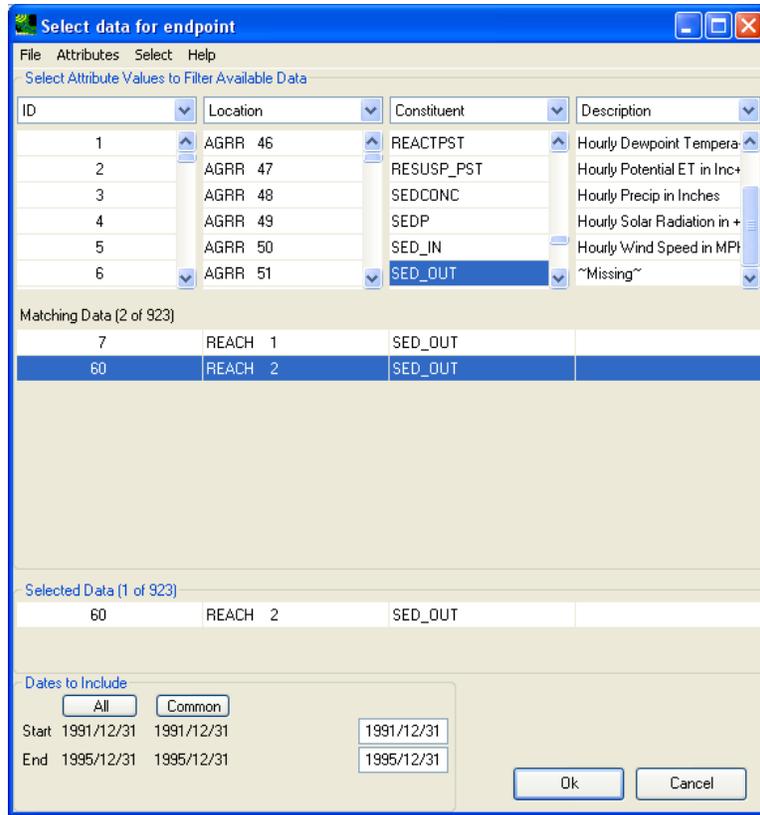


Now we are to define the endpoints to be examined with climate changes.

- Navigate to the 'Assessment Endpoints' tab and click on the 'Add' button to bring up the data selection window. Select the 'FLOW\_OUT' constituent as shown below:

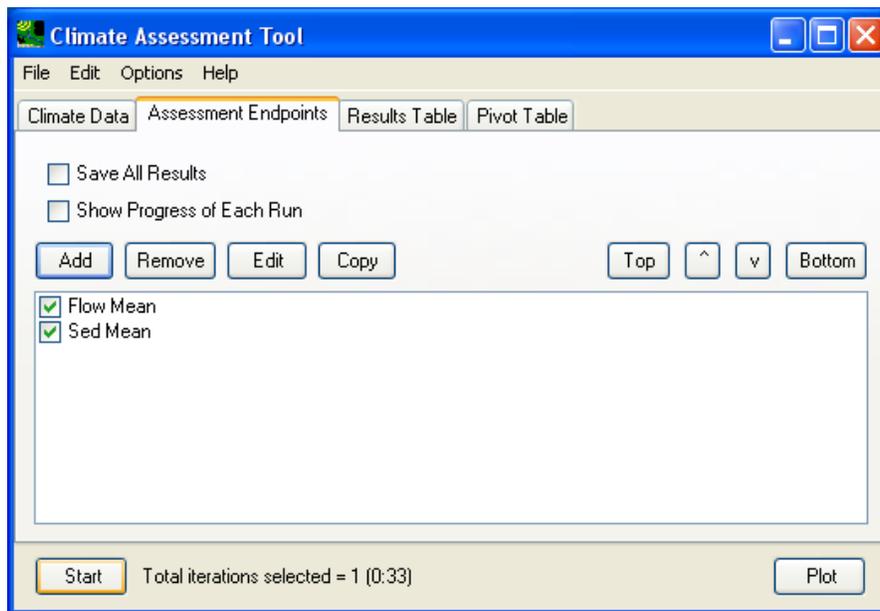


- Click the 'Ok' button to save this selection for later use.
- Click on the 'Add' button again to select another endpoint, 'SED\_OUT', as shown below.



8. Click the 'Ok' button to save this selection for later use.

Now you have two endpoints defined as shown below:

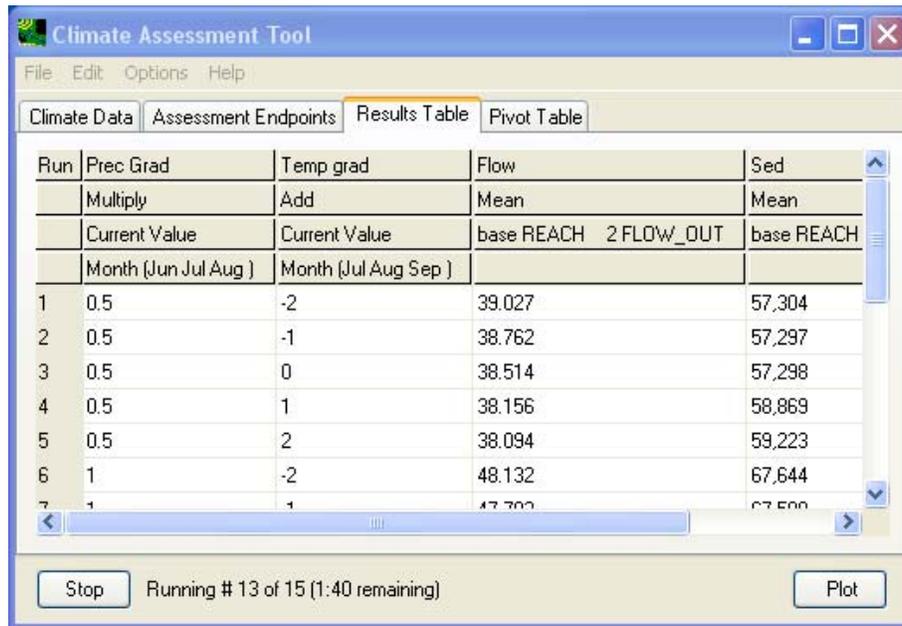


### C. Define Endpoints for the CAT analysis

QUESTION ANSWERED:

3) How do I conduct batch SWAT simulations for climate change scenarios?

1. Click the ‘Start’ button to initiate the batch simulation process and wait for results as shown below. Once the simulations begins, the ‘Start’ button changes to ‘Stop’ and the run status is shown as text next to it.



The whole simulation process is done when the ‘Finish runs’ text is shown at the bottom of the CAT window, near the ‘Start’ button as shown below.

Run	Prec Grad	Temp grad	Flow	Sed
	Multiply	Add	Mean	Mean
	Current Value	Current Value	base REACH 2 FLOW_OUT	base REACH 2 SED_OUT
	Month (Jun Jul Aug )	Month (Jul Aug Sep )		
1	0.5	-2	39.027	57.304
2	0.5	-1	38.762	57.297
3	0.5	0	38.514	57.298
4	0.5	1	38.156	58.869
5	0.5	2	38.094	59.223
6	1	-2	48.132	67.644
7	1	-1	47.782	67.508
8	1	0	47.328	67.282
9	1	1	46.664	68.493
10	1	2	46.42	68.875
11	1.5	-2	60.434	83.484
12	1.5	-1	59.678	82.848
13	1.5	0	59.01	82.364
14	1.5	1	58.136	83.530
15	1.5	2	57.69	83.564

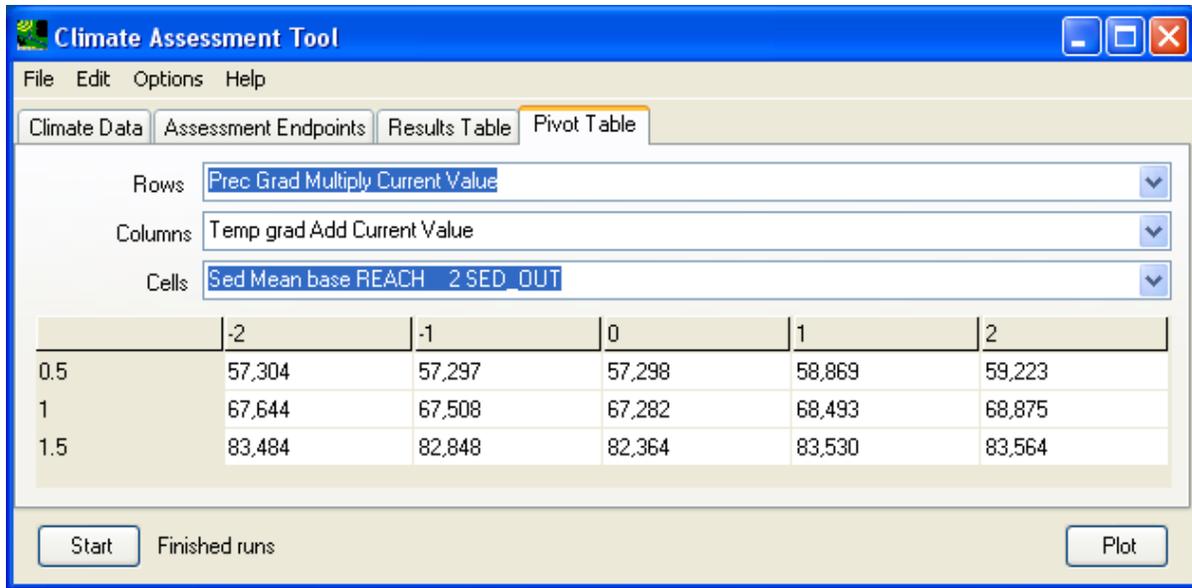
2. The resulting endpoints are shown in a grid in the ‘Results Table’ for all the combination of the gradients for the two climate changes defined during step 2.
3. Now, navigate to the ‘Pivot Table’ tab to examine the outputs in a common pivot table format. The results are shown below.

Rows: Prec Grad Multiply Current Value

Columns: Temp grad Add Current Value

Cells: Flow Mean base REACH 2 FLOW\_OUT

	-2	-1	0	1	2
0.5	39.027	38.762	38.514	38.156	38.094
1	48.132	47.782	47.328	46.664	46.42
1.5	60.434	59.678	59.01	58.136	57.69



To save the climate variations as we have defined, go to the **File** menu and select **Save Climate and Endpoints**. Select the location and file name for the setting file to be saved as shown below.

