Creating a WinEPIC / CroPMan / WinAPEX Database and Related Files for Your Area Using the Texas Central Database

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This manual will describe all of the steps for creating your new database. Please follow the directions completely and carefully. DO NOT modify tables in the database which you are not specifically instructed to modify. Modifying tables other than those which will be addressed in this manual will cause problems with the function of the model and your new database WILL NOT be successful. New crops, management and rotations should ONLY be added or modified through the interface in the DATA/SETUP section. If you follow the instructions detailed in this manual closely, a high rate of success is probable.

It is recommended that a copy be made of the TEXAS CENTRAL database and the copy renamed appropriately for your area. This will allow for changes to the database without compromising the original data and will provide a backup database if the need arises. This user's guide will provide the needed information to correctly set up the renamed database for use with CroPMan, WinEPIC or WinAPEX. The database is located in the cpm0320V2 directory (WinAPEX directory, if WinAPEX is the interface in use). From this point forward, any reference to tables in the database will be referring to the tables in the new renamed database, and any reference to "original" data will be referring to data which was provided with the TEXAS CENTRAL database. If a password is required to access the database, enter "T321". All table names will be in ALL CAPS; columns or fields within the tables will be in *bold italics*; any reference to a specific button within an interface will be in **ROCKWELL EXTRA BOLD** print.

Removing Password Protection
When you rename your database, the interface will not recognize it due to the password protection that has been placed on the database. If the password protection is removed, the interface will then be able to recognize your database. To remove the password, open Microsoft ACCESS. Click on File – Open. Navigate to your newly named database. Highlight the database name—DO NOT double click the name. On the Open button you will notice a drop down arrow. Click on that arrow and select "Open Exclusive". You will be prompted to enter the password. Enter T321. Click on the Tools menu in the toolbar, and select Security and then Unset Database Password. You will be prompted again to enter the password. Enter T321. Close the database and it will then be recognized by the interface.

I. SETTING UP THE LOCATION TABLE

Open the LOCATION table. Replace the name of the original location name with the new location name in *Thisloc* . This should be the state name. A list of the states and territories of the United States can be accessed by opening the STATES table. If the area of interest is not one of the states or territories listed in the

STATES table, enter the name of the country in the *Thisloc* column of the LOCATION table. This is the Location name and must remain consistent throughout all tables.

Next, enter the State 2-letter abbreviation in the *Thistate* column. This abbreviation can also be accessed in the STATES table. If the area of interest is not listed in the STATES table, choose any 2-letter identifier for the state ID. This State ID must remain consistent throughout all tables.

Enter the minimum Latitude (*latmin*), maximum Latitude (*latmax*), minimum Longitude (*longmin*) and maximum Longitude (*longmax*) values for the state or country (if not within the United States). No (+) or (-) sign is required here. These values dictate the outside boundaries of the location. The model will not allow the user to create farms outside of these boundaries.

II. SETTING UP THE COUNTIES DATA

Open the COUNTIES table. A line must be added for each county/providence of interest pertaining to the location described in the LOCATION table. First, enter the *State* 2-letter abbreviation just as it was entered in the LOCATION table (*Thistate* column). Next, enter the *Location* name as it was entered in the LOCATION table. Enter each county/providence name in the *county* column within the area of interest. Each county must have a unique *FIPS* code. This will consist of the *fips* code found in the STATES table adjacent the state name. In addition to the fips code, the *FIPS* code in the COUNTIES table includes a 3-digit county identifier which can simply begin at "001" for the first county, "002" for the second and so on. If the location is not a state named in the STATES table, use "99001", "99002", and "99003" and so on for the county FIPS codes. The *SoilFips* code pertains to the soil code for each county. If each county will have a set of unique soils, then the *SoilFips* code can be identical to the *Fips* code (Figure 1a) for each county. If, however, one set of soils will be used for all counties, then the *SoilFips* can equal the *Fips* code of the first county (Figure 1b). The *State2* column should be identical to the *State* column.

Figure 1a. Counties table with one SoilFips for each county.

Figure 1b. Counties table with one SoilFips used for all counties.

Once all of the new counties have been added, the original list of counties can be deleted by highlighting all of the lines pertaining to the original counties and then pressing the DELETE key.

III. CREATING A DEFAULT USER ID

Open the PRODUCERS table. Modifications will be made to ProducerID #1 (***Last name*** = Default User) to create a default user specific to the location. Change the ***City*** to an appropriate city name. Change the ***State*** name to be consistent with that entered in the LOCATION and COUNTIES tables. Change the ***Country*** name accordingly. Change the ***Location*** name to be consistent with that entered in the LOCATION table.

IV. CREATING A SAMPLE RUN UNIT

Open the FARM TABLE table. Modifications will be made to RunitID #1 and #2 (***ProducerID*** = 1) to create two sample run units (farms) (one dryland and one

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sprinkler irrigated) specific to the producer created in Section III. Change the *County* name on RunitID #1 and #2 to match a county name entered in the COUNTIES table. Change the *State* name on each run unit to be consistent with the State name entered previously in the LOCATION and COUNTIES table. Enter the latitude degrees *(latde)*, latitude minutes *(latmi)*, latitude seconds *(latse)*, longitude degrees *(longed)*, longitude minutes *(longmi)* and longitude seconds *(longse)* for any particular location (farm) within the area of interest. The same values should be used for both run units. Make changes to the latitude *(latsign)* and longitude *(longsign)* signage accordingly. Enter the latitude *(YLT)* in decimal degrees. Enter the elevation *(ELEV)* in meters. The "YLT" and "ELEV" values should be the same for each of the run units. Later, if changes need to be made to these run units, edits can be made through the interface.

V. CREATING WEATHER STATIONS

To create weather files, using Weather Import (downloadable at http://epicapex.tamu.edu/downloads/model-executables/weather-import/ is recommended.

The user can use the Weather Import to download and filter (format data into WinEPIC/CroPMan/WinAPEX usable format (.DLY)) weather data from select websites, or weather data can be formatted in Excel and filtered using the Excel worksheet filter in Weather Import.

If weather is downloaded from one of the websites provided through Weather Import, follow the directions for downloading the weather data provided for each weather site. Use the weather filter associated with each weather website (gray button in the lower left corner of screen) to format the weather data into a *.DLY. From this point continue with creating a wind station in Section V.B.

The second method (formatting data in Excel) should be used if the user retrieves weather data from a source other than the websites made available through Weather Import. Weather data must be organized in the following specific order: YEAR, MONTH, DAY, SOLAR RADIATION, MAXIMUM TEMPERATURE, MINIMUM TEMPERATURE, PRECIPITATION, RELATIVE HUMIDITY, and WIND SPEED. See Figure 2 for an example. Only the underlined abovementioned weather variables are required. If the remaining variables are not available, a blank column should be left. **It is also very important to make certain that all of the data is only carried out to 2 or fewer decimal places.**

Figure 2. Example Excel weather file.

- YEAR should be a four-digit number.
- MONTH and DAY can be one- or two-digit numbers.
- SOLAR RADIATION units can be either MJ/m² or langleys.
- MAXIMUM and MINIMUM TEMPERATURE units can be either °F or °C.
- PRECIPITATION units can be either inches or millimeters
- RELATIVE HUMIDITY should be expressed as a fraction.
- WIND SPEED units must be in meters per second.

Once the data has been formatted as specified, it should be saved as a *tab-delimited text file.*

A. CREATING A WEATHER FILE (.DLY)

If the user is accessing one of the websites already programmed into Weather Import (Figure 3), they need to simply follow the instructions that can be downloaded in PDF format by clicking the "For Instructions…" button.

Figure 3. Weather websites download screen.
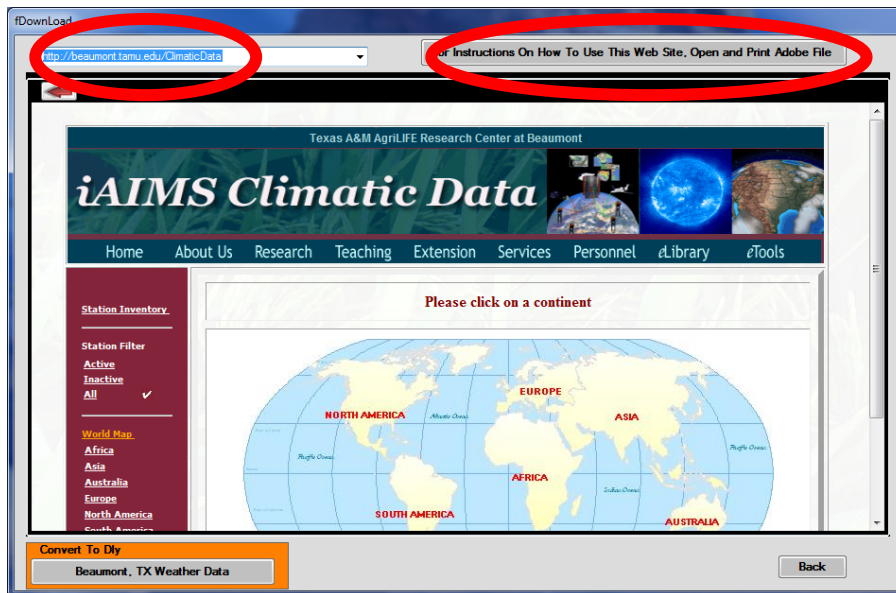
To convert the tab-delimited text file into a WinEPIC/CroPMan/WinAPEX usable format containing weather data obtained from a source other than the provided websites, it must be filtered using the **EXCEL CROPMAN WEATHER (TAB DELIMITED)** filter. To access this filter click the **EXCEL CROPMAN WEATHER (TAB DELIMITED)** button (Figure 4).

Figure 4. Main screen.

Select the text file to be converted to a *.DLY file (Figure 5). Next indicate whether the temperature data in the text file was in Fahrenheit or Centigrade, whether the precipitation data was in inches or millimeters, and whether to create a new file or to append/update an existing file (Figure 6).
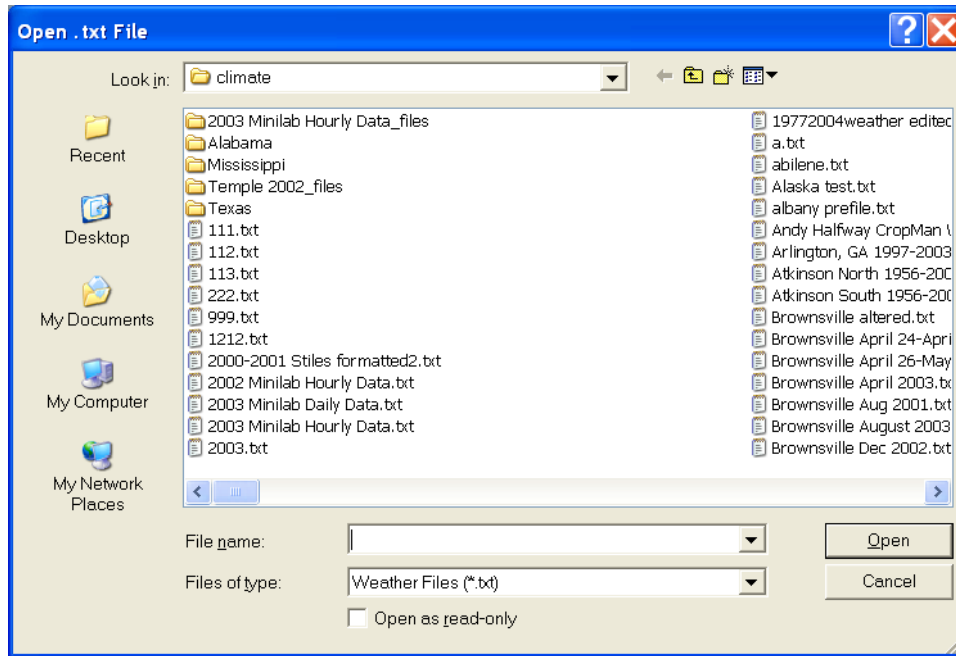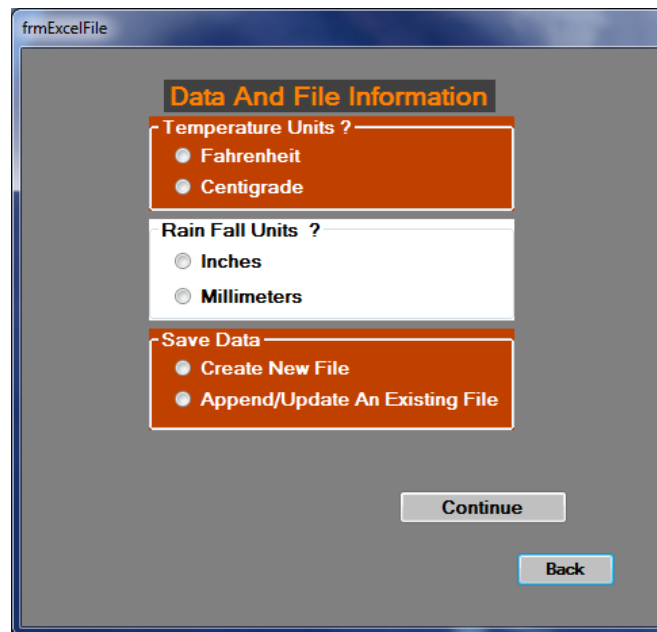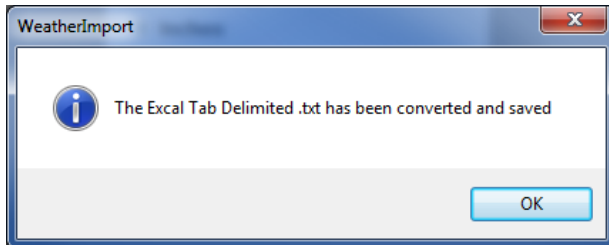
*Figure 5. Selecting file to be converted to *.DLY*

Figure 6. Data and File screen.

If "Create New File" was chosen, enter a file name to save the file as and click **SAVE**. If the file was successfully imported and converted the following message will appear (Figure 7).

Figure 7. Successful import message

"Append/Update An Existing File" allows the user to add new weather data to an existing weather data file. For example, a previously filtered file containing January through December 2007 weather data could be combined with January through April 2008 data creating only one file with weather data from January 2007 through April 2008 instead of two separate files.

If the "Append/Update An Existing File" option was chosen, the user will be asked to choose the weather file to which the new weather data will be added (Figure 8).

Figure 8. Selecting weather file to add or update with new weather data.
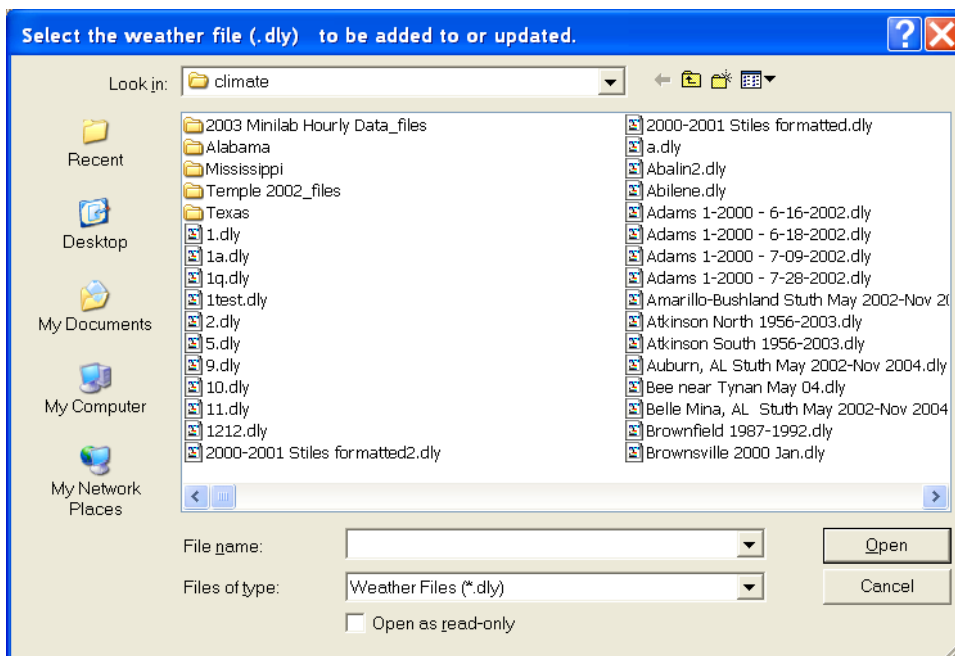
If the weather data was successfully combined, the following message will appear (Figure 9).

Figure 9. Successful import and update message

B. CREATING A WIND STATION

To create a weather station, a wind station is required. The wind station consists of average monthly wind speeds and average directional wind frequencies for sixteen directions. One wind station can be used for numerous weather stations as applicable. To create a wind station, open the WIND DATA table. The table consists of a *recnum*, *Lookup*, *Month*, *UAVM* and *D1* through *D16* columns. The *recnum* number will automatically be added as new records are added to the end of the table. The *Lookup* name is the wind station ID. Each time this name is used along with a weather station, it must be entered exactly as it is here. *UAVM* is the average monthly wind speed in meters per second. *D1* through *D16* are the directional wind frequencies.   The following table indicates the wind direction for each ID.

ID	Wind Direction	ID	Wind Direction
D1	North	D9	South
D2	North Northeast	D10	South Southwest
D3	Northeast	D11	Southwest
D4	East Northeast	D12	West Southwest
D5	East	D13	West
D6	East Southeast	D14	West Northwest
D7	Southeast	D15	Northwest
D8	South Southeast	D16	North Northwest

Each wind station requires this information to be filled in.   If directional frequencies are not available, zero may be entered in these cells. *Lookup*, *Month* and *UAVM* are required for the model to run. After data has been added for all wind stations, the original wind stations (wind stations provided with the TEXAS CENTRAL database) may be deleted by highlighting the corresponding rows and pressing the DELETE key.

Next open the WIND LIST table. This table contains a listing of all wind stations available for use with weather stations. In this table *Lookup*, *EPIC_wind_name*, *State* and *Station* are the only required information. The other columns may be filled in with "Unknown", "0" or "unk" in accordance with the values used for the original wind stations. Values for *Lookup* should be entered exactly as they were in WIND DATA. It is recommended that the Lookup name be copied directly from the WIND DATA table and pasted in the WIND LIST table to avoid typing errors. The *EPIC_wind_name* should be identical to the Lookup name. *State* can be any two-character identifier. This identifier will be used in other tables within the database, so it must remain consistent throughout all the tables. *Station* should also be identical to the Lookup name. Once all of the wind stations created in the WIND DATA table have been added to the WIND LIST table, the original wind station data can be deleted.

C. CREATING A WEATHER STATION AND MONTHLY WEATHER DATA

Before making the weather station and monthly file, it is wise to use the **EDIT/CHECK WEATHER DATA** feature in Weather Import to check the data for missing days and/or out-of-range data. Click on **EDIT/CHECK WEATHER DATA** button (see Figure 4). Click the **SELECT WEATHER FILE (DLY) TO EDIT** button (Figure 10). Navigate to your weather file, highlight the file name and click **OPEN**.

Figure 10. Select weather file to edit.
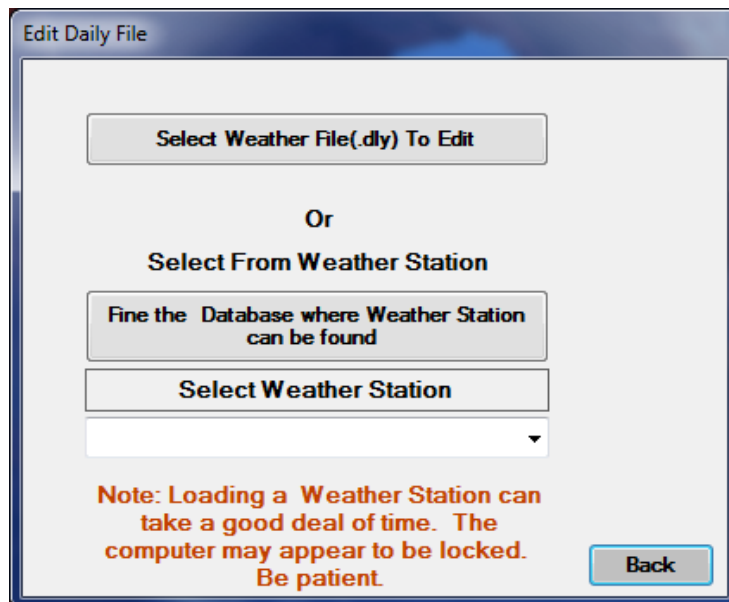
The file will be displayed in the form of a worksheet (Figure 11). First, you will need to check for missing days. Click on the **Check For Missing Days**. The program will search your data and indicate any missing days in red (Figure 12).

Figure 11. Weather file worksheet.

Figure 12. Missing Day/Out of Range/Temperature Data

Edit Daily File

YEAR	DAY	Sol. Rad. MJ Current	New	Maximum Temp. Fahr. Current	New	Minimum Temp. Fahr. Current	New	Precpi-tation Inches Current	New	Rel. Hum. Fraction Current	New	WIND Speed miles/hr Current	New	CO2 ppm Current	New
1972	1	0		999		999		999		0		0		0	
1972	2	0		999		999		999		0		0		0	
1972	3	0		999		999		999		0		0		0	
1972	4	0		999		999		999		0		0		0	
1972	5	0		999		999		999		0		0		0	
1972	6	0		999		999		999		0		0		0	
1972	7	2		32		5		0.02		0.75		14.74		0	
1972	8	8		10.04		12		0		0.53		9.22		0	
1972	9	1		37.04		-0.94		0		0.69		14.92		0	
1972	10	7		39.02		30.02		0		0.7		9.19		0	
1972	11	6		39.92		21.02		0		0.66		8.05		0	
1972	12	7		35.06		19.94		0		0.6		7.56		0	
1972	13	4		46.94		26.96		0.2		0.68		14.14		0	
1972	14	8		17.06		1.04		0		0.6		11.39		0	
1972	15	7		6.08		3.92		0		59	.59	11.18		0	
1972	16	8		8.96		-18.94		0.33		0.53		8.59		0	
1972	17	3		26.96		-14.08		0.03		0.68		11.88		0	
1972	18	2		42.98		17.06		0.02		0.64		12.64		0	
1972	19	7		39.02		26.96		0		0.62		16.91		0	
1972	20	3		12.92		8.06		0.21		0.64		10.31		0	
1972	21	9		6.08		-5.08		0		0.59		7.54		0	
1972	22	3		41		-5.98		0.14		0.7		10.56		0	
1972	23	2		37.94		15.98		0		0.68		11.05		0	
1972	24	9		42.98		10.94		0.12		0.58		9.15		0	
1972	25	4		35.06		12.02		0		0.55		26.53		0	
1972	26	10		6.08		-5.98		0		0.4		12.89		0	

Legend: Missing Day | Out Of Range | Max Temp < Min Temp

English — Save — Cancel — Default — Check For Missing Days — Select Year

If data is available for the missing days, it can be entered at this point. Otherwise, if it is left as "999", the model will generate weather data for those days. Data which is out of range will be highlighted in yellow (Figure 12). This data must be corrected before this file can be used to create a weather station and monthly file.   If the maximum temperature is less than the minimum temperature, it will be highlighted in bright pink. This data must also be corrected in order for this file to be used to create a weather station and monthly file. Once all data has been corrected, click the **REWRITE DLY AND BACK** button. The weather file can now be used to create a weather station and monthly weather file.

Weather Import will be used to create the weather stations and monthly weather data.   Two tables in the database will automatically be updated with the appropriate data. The WEATHER DATA table corresponds to the monthly weather data and the WEATHER LIST table is a listing of all the weather stations. To create the weather stations, click on **CREATE USER WEATHER STATION AND MONTHLY FILE FROM .DLY** (Figure 4).

First, the interface will ask you to select a database to write the new data to. This should be the TEXAS CENTRAL database or a similar database. Then the DLY that will be used to create the weather files must be selected (Figure 13). Click on **FIND .DLY TO MAKE NEW WEATHER STATION FROM**. Locate the file on the computer, highlight the file name and click OPEN.

Figure 13. Locating .DLY to create weather station from
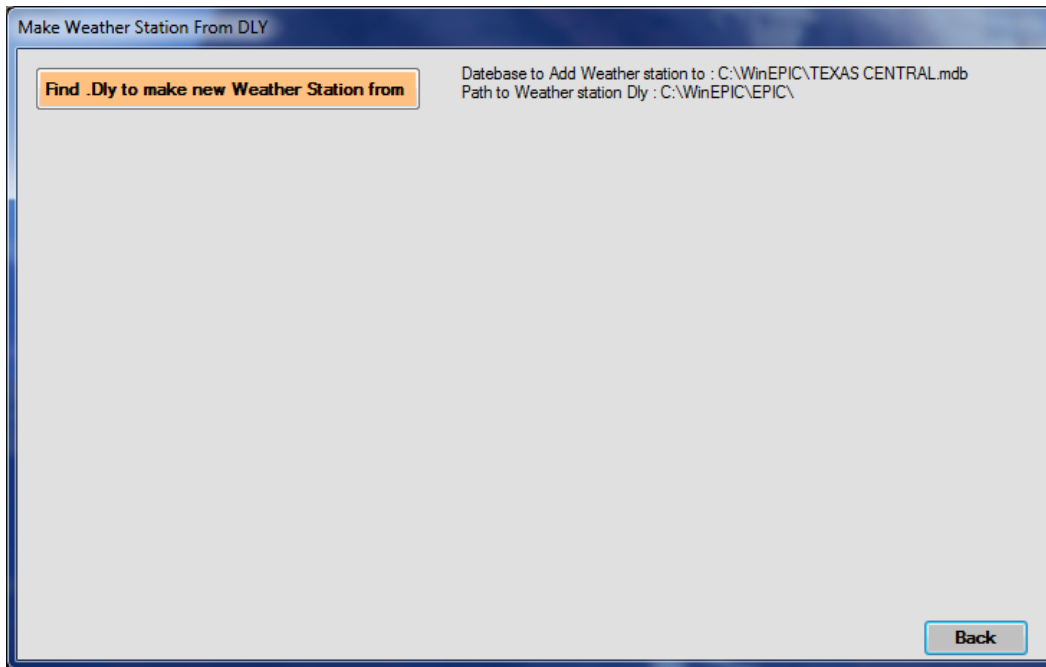
A new screen will appear (Figure 14). You may select a nearby weather station from the list which will be used to fill in missing data; this is optional. Select the County and Wind Station for the new station. Enter a name for the new weather station. Enter a DLY name (8 characters or less). Enter the latitude and longitude in degrees. Make certain to also include the correct sign (+) or (-) in front of the latitude and longitude values. Enter the elevation in **meters** of the weather station. Click ADD NEW STATION.

Figure 14. Adding a new weather station

If the station was successfully added, a message such as Figure 15 will appear.

Figure 15. Successful added weather station message
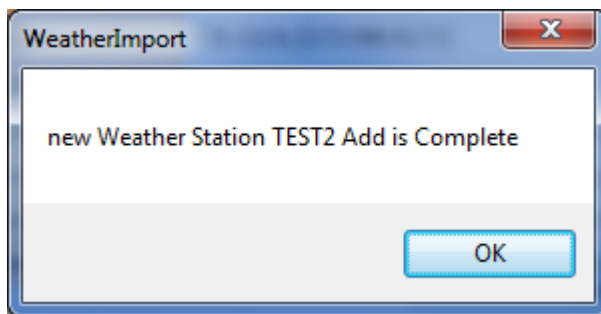
To add additional weather stations repeat steps described above beginning at selecting the .DLY to make the new weather station from.

Once all of the weather stations have been added, the original weather station data can be deleted. This is optional. To do this, open the new database. Open the WEATHER DATA table; highlight all the original weather station data making certain NOT to highlight the "MISSING LINE" row. Press the DELETE button. Close the WEATHER DATA table.

The WEATHER DATA DEFAULT table must then be updated with the new weather data. Highlight the WEATHER DATA table name in the list of tables. Right click, copy and paste the table. Make certain "Structure and Data" is selected (Figure 18). In the "Table Name" area type "WEATHER DATA DEFAULT" just as it is in the database table list and click **OK**.

Figure 18. Paste table as message
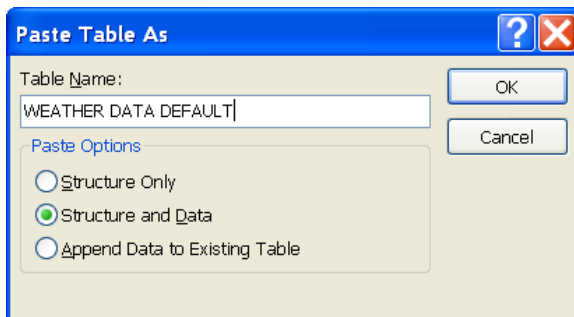
If the table name was entered correctly, the following message should appear (Figure 19). Click **YES.**

Figure 19. Name already exists message
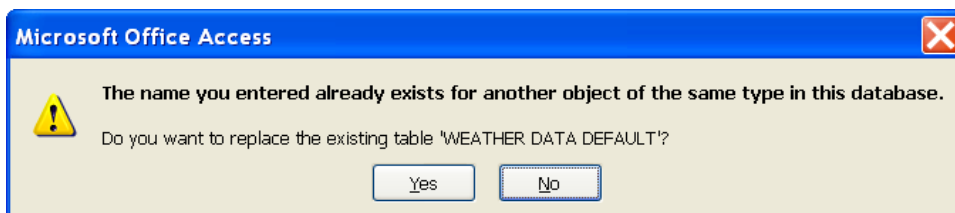
Next, open the WEATHER LIST table. Highlight the original weather stations and delete.

VI. SETTING UP SOILS DATA

Open the SOILS DATA table. A description of each soil data variable is included below.

Variable ID	Description	Units	Required status
FIPS	The FIPS code for the soil must correspond to a county. The County *FIPS* code and corresponding *SoilFips* code were set up in the COUNTIES table. Using the COUNTIES table *SoilFips* column, code the soils for each county accordingly.		Required
MUSYM	Musym is the soil symbol name. Any appropriate symbol name can be entered here. If this symbol name is unknown, enter "unknown" in this field.		Name or "unknown" required
Lookup	The Lookup field consists of the soil name and texture classification		Required
State	This is the state identification. This ID should be consistent with that entered in the LOCATION and COUNTIES tables		Required
S5NUM	Soils 5 number. If this number is unknown, enter "unknown" in this field		Number or "unknown" required
TEXTID	The TEXTID refers to the texture identification for the soil layer. For a list of texture identifications refer to the SOIL_TEXTURES table.		Required
HYDGRP	The HYDGRP refers to the hydrological group. If this information is not available, the following general rules can be used to assign a hydrological group to the soil layer. • HYDGRP = A if soil sand content is $\geq 80\%$ • HYDGRP = B if soil sand content is $60 - 80\%$ • HYDGRP = C if soil sand content is $< 50\%$ and soil clay content is $< 40\%$ • HYDGRP = D if soil clay content is $> 40\%$		Required
Layer_Number	Soil layer number		Required
SALB	Soil albedo		Required
Z	Depth from soil surface to bottom of soil layer	m	Required
BD	Moist bulk density	g/cm^3	Required

U	Soil water content at wilting point (1500 KPa or -15 bars)	m/m	NOT Required
FC	Soil water content at field capacity (33 KPa or -1/3 bars)	m/m	NOT Required
SAN	Sand content	Fraction	Required
SIL	Silt content	Fraction	Required
WN	Initial organic N concentration	g N/Mg or ppm	NOT Required
PH	Soil pH		Required
SMB	Sum of bases	cmol/kg	NOT Required
CBN	Organic carbon concentration	%	Required
CAC	Calcium carbonate content of soil	%	NOT Required
CEC	Cation exchange capacity	cmol/kg	Required
ROK	Coarse fragment content	Fraction	NOT Required
CNDS	Initial soluble N concentration at the beginning of the simulation	g/Mg	NOT Required
O	Initial labile phosphorus concentration at the beginning of the simulation	g/Mg	NOT Required
RSD	Crop residue at beginning of simulation	t/ha	NOT Required
BDD	Dry bulk density (oven dry)	g/cm^3	NOT Required
PSP	Phosphorus sorption ratio. The fraction of phosphorus adsorbed on soil particle surfaces.	Fraction	NOT Required
SC	Saturated conductivity. Rate at which water passes through the soil layer, when saturated.	mm/h	Required
RT	Initial soil water storage. Fraction of field capacity initially available at the start of the simulation	Fraction	NOT Required
WP	Initial organic phosphorus concentration contained in humic substances for all soil layers at the beginning of the simulation	g/Mg	NOT Required
CPRV	Fraction inflow partitioned to vertical crack or pipe flow	Fraction	NOT Required
CPRH	Fraction of inflow partitioned to horizontal crack or pipe flow	Fraction	NOT Required

Each soil must have the abovementioned data filled out for each layer of the soil profile. Scroll to the end of the soil data. Enter new data on the blank

"AutoNumber" line. If data is not known and is not required, fill the column with "0".

After all soil data has been entered, the original soils data can be deleted. To do this highlight all the original soils data. Press the DELETE button. Close the SOILS_DATA table. To update the SOILS DATA DEFAULT table, highlight the SOILS_DATA table name in the list of tables. Right click, copy and paste the table. Make certain "Structure and Data" is selected (Figure 20). In the "Table Name" area type "SOIL DATA DEFAULT" just as it is in the database table list and click **OK**.

Figure 20. Paste table as message
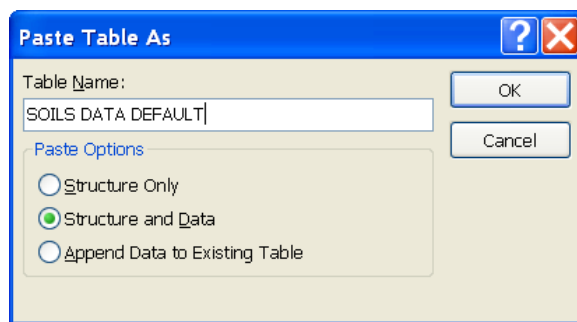
If the table name was entered correctly, a message like that shown in Figure 19 should appear. Click **YES.**

VII. SETTING UP SOILS LIST

Open the SOILS_LIST table. Scroll to the end of the list of soils. A line for each soil added to the SOILS_DATA table must be added to the SOILS_LIST. The *selected* column should contain a "y" for all entries. Enter the *Location* name which must be consistent with the *Location* name entered in the LOCATION and COUNTIES tables. Enter the *FIPS* code for the soil based on the COUNTIES (*SoilFips*) and SOILS_DATA (*FIPS*) tables. Enter the *MUSYM , Lookup, STATE, and S5NUM* as they were entered in the SOILS_DATA table.   The *S5NAME* can be identical to the *Lookup* name.   Enter the *TEXTID* and *HYDGRP* which corresponds to the *TEXTID* and *HYDGRP* in the SOILS_DATA table for the first layer of each soil.   Enter the *lower slope* and *upper slope* for each soil. The lower and upper slopes refer to the range in slope that can be found for each of the soils. Enter the *SALB* which corresponds to the *SALB* of the first layer of each soil in the SOILS_DATA table.

After all soil list data has been entered, the original soils list data can be deleted. To do this highlight all the original soils list data. Press the DELETE button.

VIII.   USING THE NEW DATABASE

After the database has been created successfully, make certain the following files are in the correct location.

FOR USE WITH WinEPIC or CroPMan

File name	Correct location
Renamed database (the newly created database)	C:\cpm0320V2
Weather station files (*.DLY)	C:\cpm0320V2\EPIC
WinEPICV4.exe or CroPManV4.exe	C:\cpm0320V2
EPIC0509.exe	C:\cpm0320V2\EPIC
WinEPIC.mdb	C:\cpm0320V2

FOR USE WITH WinAPEX

File name	Correct location
Renamed database (the newly created database)	C:\WinAPEX
Weather station files (*.DLY)	C:\WinAPEX\APEXPROG
WinAPEX.exe	C:\ WinAPEX
APEX0604.exe	C:\ WinAPEX\APEXPROG
WinApexOut.mdb	C:\ WinAPEX *and* C:\WinAPEX\APEXPROG

Open the appropriate interface (WinEPIC, CroPMan, or WinAPEX) and click on the FILE menu at the top of the screen. Select "Change Database". Select the newly created database name and click BACK if necessary to return to the main screen of the interface. The new database is now ready for use with the software.