

## HEC-EFM 5.0 September 2020 Release Notes

Version 5.0 supersedes version 4.0, which was released in April 2017. Installing version 5.0 will not overwrite any previous software versions. Also, the new version is backward compatible, which means that any HEC-EFM project files created with previous versions are fine and ready for use with version 5.0.

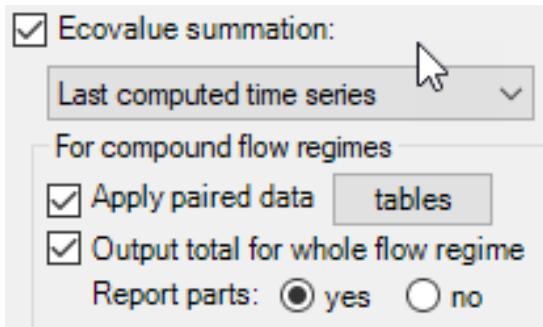
Version 5.0 is available as both an install package (.exe) and an archive of files (.zip). The install package guides the user through the install process and requires computer administrative rights for successful use. Installing with the archive of files does not require administrative rights. Simply extract all contents of the archive to the desired computer location and the software will be ready for use.

During numerical testing performed at HEC, version 5.0 exactly reproduced quantitative results generated with versions 4.0, 3.0, and 2.0, but users are encouraged to verify their existing applications.

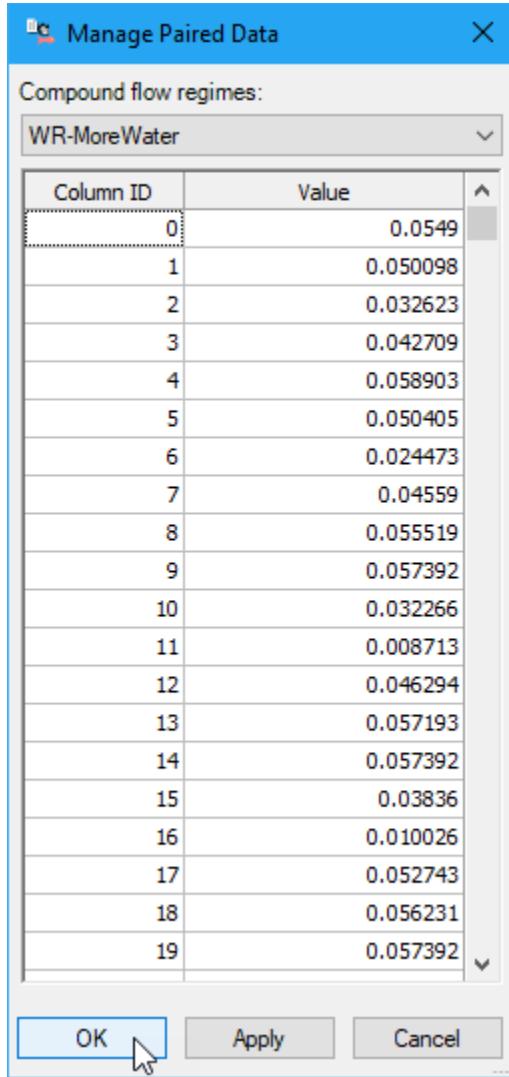
Version 5.0 is programmed in Visual Basic .NET. It includes several new features, improved software behaviors, and bug fixes for issues that were not detected prior to release of version 4.0. The Quick Start Guide has also been updated and is currently the most complete and comprehensive source of information about the software. Changes incorporated in the new versions follow:

### New Features

- *Ecovalue summations.* New options were added that allow the ecovalues provided by different flow regimes to be tallied per whole seasons and flow regimes for compound flow regimes. In other words, EFM can now tally ecovalues for the individual geometry elements used in 2-dimensional river hydraulics modeling.



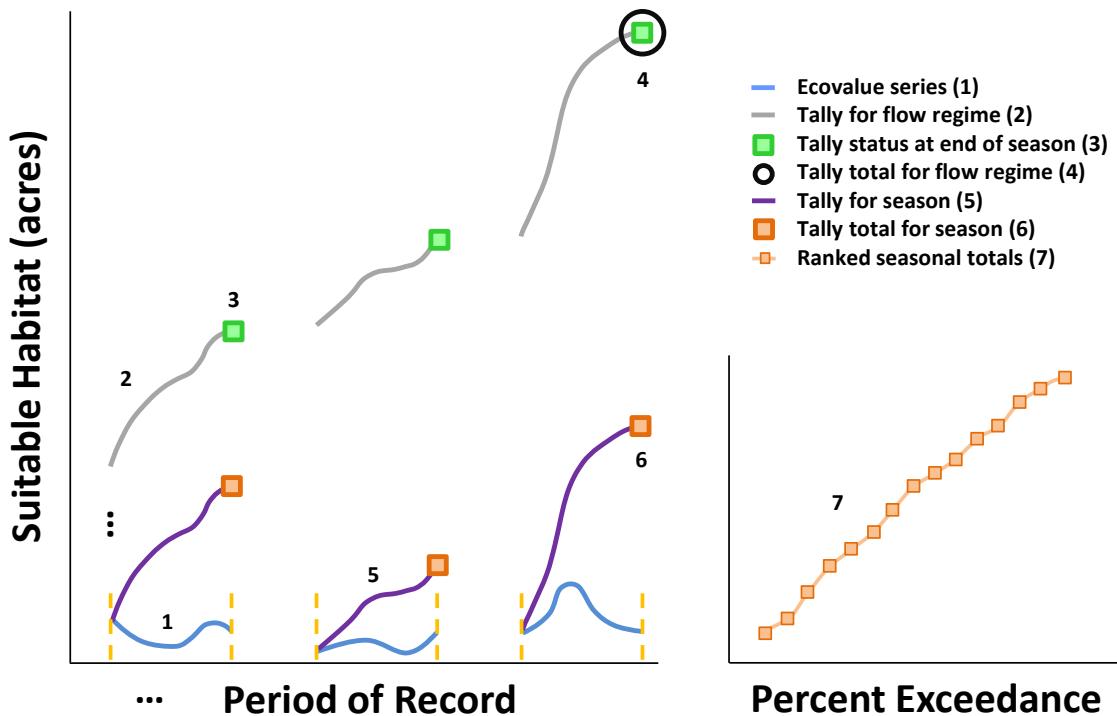
The associated paired data option enables ecovalues to be translated to another metric such as area. A typical application of this option would be to translate ecovalues of habitat suitability (measured 0 to 1, where 1 is wholly suitable) to suitable area based on a paired data table of element ID and element area.



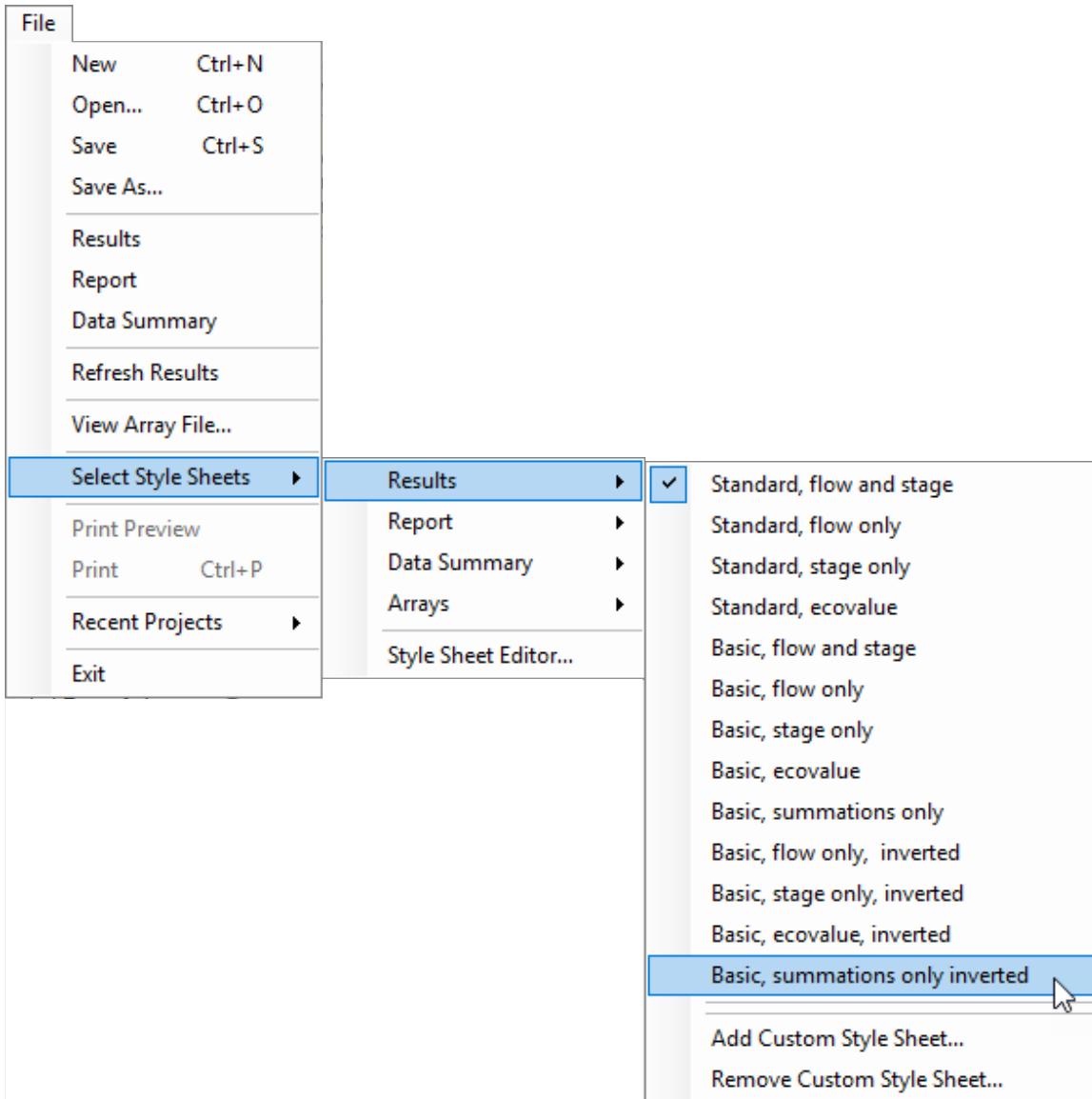
The screenshot shows a software dialog titled "Manage Paired Data". At the top, it says "Compound flow regimes:" followed by a dropdown menu set to "WR-MoreWater". Below this is a table with two columns: "Column ID" and "Value". The "Value" column contains 20 entries ranging from 0.024473 to 0.0549. The table has scroll bars on the right and bottom. At the bottom of the dialog are three buttons: "OK" (highlighted with a cursor), "Apply", and "Cancel".

Column ID	Value
0	0.0549
1	0.050098
2	0.032623
3	0.042709
4	0.058903
5	0.050405
6	0.024473
7	0.04559
8	0.055519
9	0.057392
10	0.032266
11	0.008713
12	0.046294
13	0.057193
14	0.057392
15	0.03836
16	0.010026
17	0.052743
18	0.056231
19	0.057392

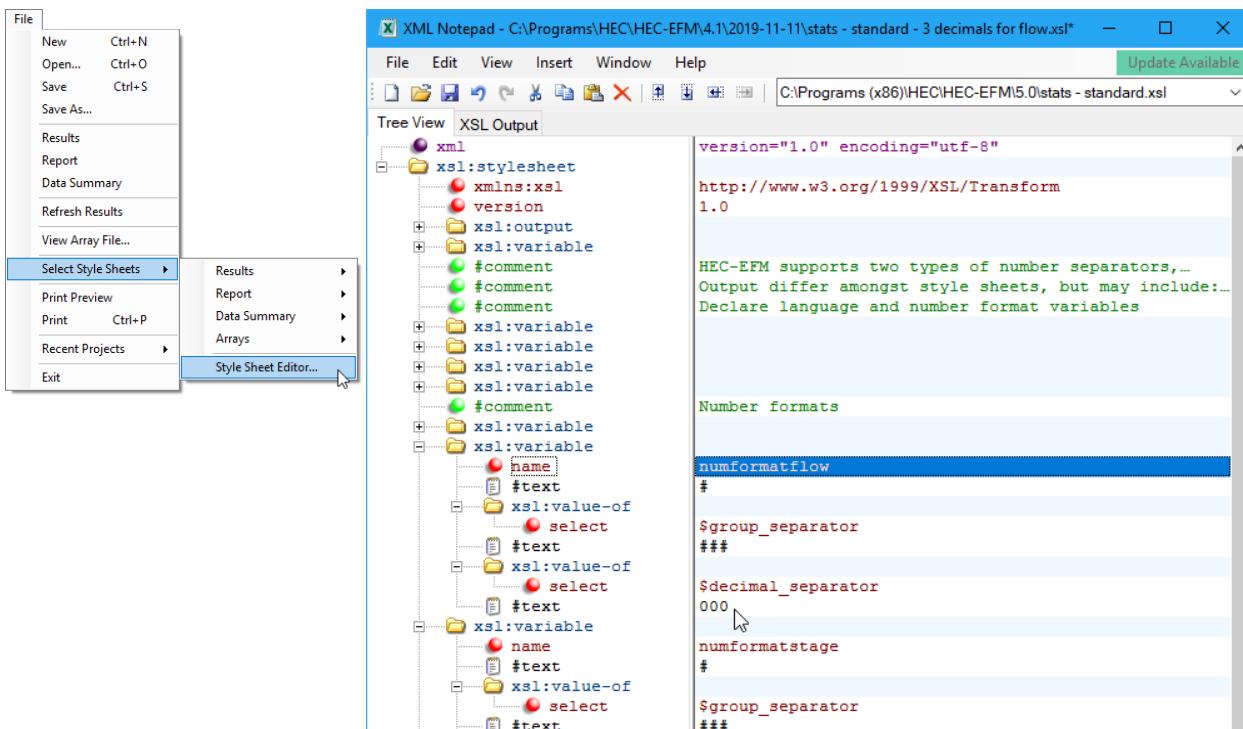
For example, if ecovalue (habitat suitability) for a particular element was 0.7 and the corresponding element area (per the paired data table) was 0.3 acres, EFM would compute a suitable area for the day of 0.21 acres, add that value to the tallies, advance a day and repeat the process until reaching the end of season and ultimately the end of the last season in the period of record. Seasonal tallies would report suitable habitat provided per season (#6 in figure). Flow regime tallies would report suitable habitat for the period of record (#4 in figure).



Summation results can be reported for the whole compound flow regime, for individual parts of the compound flow regime, or for both whole and parts. This is controlled via the new “Output total for the whole flow regime” option. EFM can also output results for particular element(s) per user selections. Users can format summations output by choosing from style sheet options provided with the software or by applying user-customizing style sheets.



- *Style sheet editor.* To better support users interested in customizing style sheets an open source editor called XML Notepad was included with EFM. Users can add and remove custom style sheets for Results, Report, Data Summary, and Arrays tables. Modifying style sheets is best done through XML editors. Several editors are available online. The open source editor included with EFM can be opened via the “File – Select Style Sheets – Style Sheet Editor...” menu option. Custom style sheets are used most often to modify numerical precision of output or appearance of tables. For the Results table, settings for numerical precision are located towards the beginning of the style sheets and can be modified by the user to adjust precision for each output variable, independently. Figure shows EFM style sheet editor being used to increase reported flow precision (from zero to three decimal places) in a Results table.



Summary						
		Natural		Gaged		
Relationship	Conf.	Stage, ft	Flow, cfs	Chg.	Stage, ft	Flow, cfs
Little minnow spawning habitat	*	4,275.2	1,226	Pos	4,275.7	1,703
Big bass winter habitat	*	4,274.1	525	Pos	4,274.3	609
Benthic macroinvertebrate biodiversity	*	4,279.4	6,620	Neg	4,277.2	3,190
Wetland health	*	4,274.3	636	Pos	4,274.5	771
Riparian tree recruitment	*	4,274.9	1,017	Pos	4,275.1	1,129
Riparian tree inundation	*	4,273.7	373	Neg	4,274.3	609

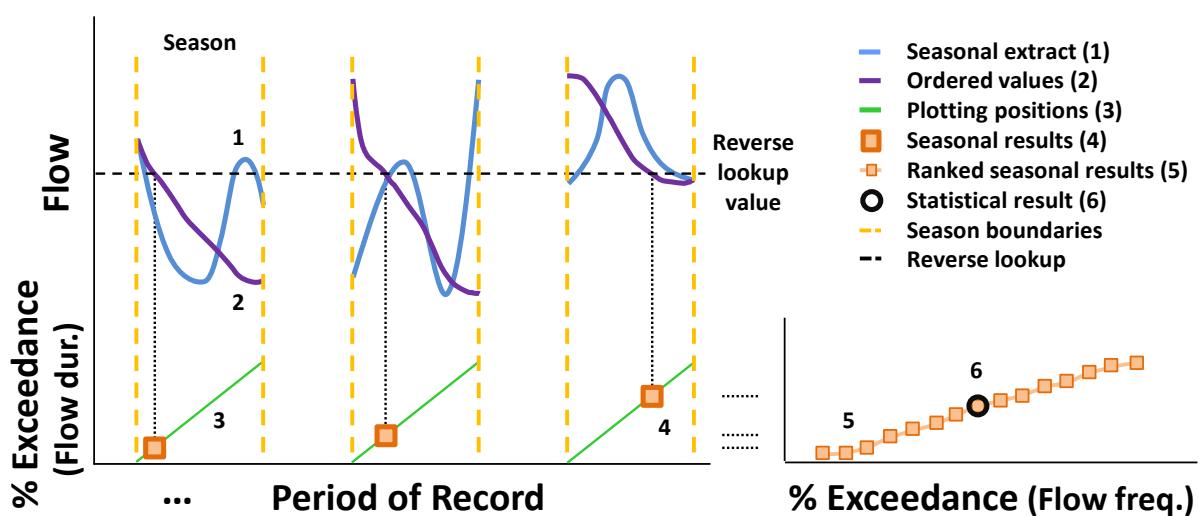
  

Summary						
		Natural		Gaged		
Relationship	Conf.	Stage, ft	Flow, cfs	Chg.	Stage, ft	Flow, cfs
Little minnow spawning habitat	*	4,275.2	1,225.721	Pos	4,275.7	1,702.500
Big bass winter habitat	*	4,274.1	524.874	Pos	4,274.3	608.536
Benthic macroinvertebrate biodiversity	*	4,279.4	6,620.048	Neg	4,277.2	3,190.000
Wetland health	*	4,274.3	635.921	Pos	4,274.5	771.000
Riparian tree recruitment	*	4,274.9	1,017.322	Pos	4,275.1	1,128.990
Riparian tree inundation	*	4,273.7	372.853	Neg	4,274.3	609.000

- *Seasonal flow duration analyses.* A new feature called the *Flow Duration: Analyze seasons* feature enables a hybrid flow duration - flow frequency analysis for relationships that also use *Time series specifications - Percent exceedance - Flow duration* and *Reverse lookup* options. Users are required to enter a *Percent exceedance* value.

Flow duration: Analyze seasons  
 Return % exceedance of

The compute process begins by applying *Season* and *Duration* criteria - as done for basic flow duration reverse lookup relationships - though this is where the basic and hybrid approaches diverge. The basic approach would then rank all daily values from all seasons in the period of record and computes the percentage of time the reverse lookup value is equaled or exceeded. The hybrid approach considers each season independently. Daily values within each season are ranked and used to compute the percentage of time the reverse lookup value is equaled or exceeded. This is repeated for each season in the period of record to compute a set of seasonal results. Seasonal results are then ranked and the *% exceedance* value associated with the *Flow Duration: Analyze seasons* feature is used to compute a corresponding percentage of time for the whole period of record.

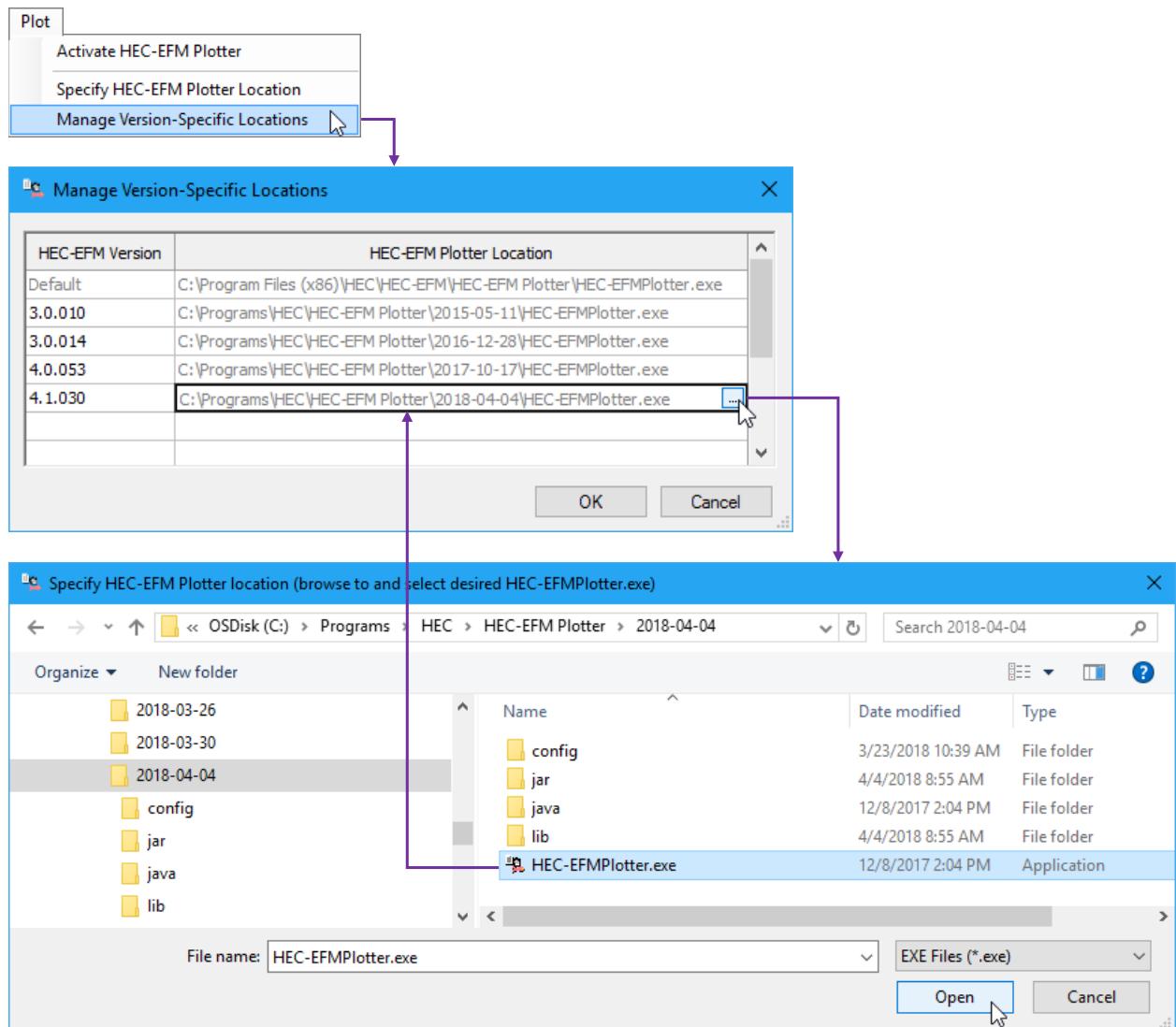


This nested approach supports consideration of season to season variability in flow duration statistics. Similar functionality is provided via the *Duration - User defined percentages* control. These hybrid approaches are among the most involved statistical analyses performed by EFM. Ordered flows and corresponding plotting position values are output to help clarify the compute sequence.

- *Connection between HEC-EFM and HEC-EFM Plotter.* Version 5.0 of EFM and version 3.0 of EFM Plotter are both portable. In other words, installation of those software do not require administrative rights or even installation packages. Simply extract or copy the corresponding software files to your computer and the software will be ready for use. An ironic caveat is, now that EFM and EFM Plotter can just be put on computers, they don't know how to find each other (a connection which used to be taken care of during the install process).

Now connections between EFM and Plotter are managed via the “*Plot – Manage Version-Specific Locations*” menu option. An interface will appear that allows the user to enter the EFM version number and open a file browser to identify the

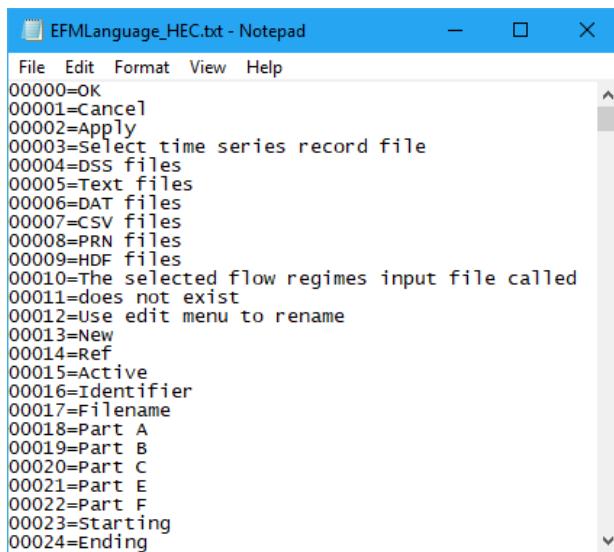
associated version of Plotter. If Plotter is launched from an unlisted version of EFM, the default location of Plotter will be used. If Plotter is not available at that location, a message will be returned to inform the user that EFM is unable to locate Plotter and ask the user to verify that Plotter is ready for use. The “*Plot – Specify HEC-EFM Plotter Location*” menu option is used to update the default location of Plotter. Plotter is still initiated via the “*Plot – Activate HEC-EFM Plotter*” menu option.



Importantly, this change was made after release of EFM 4.0. EFM 4.0 users are encouraged to continue to install Plotter, whether 3.0 or earlier, to a consistent install location using the install package.

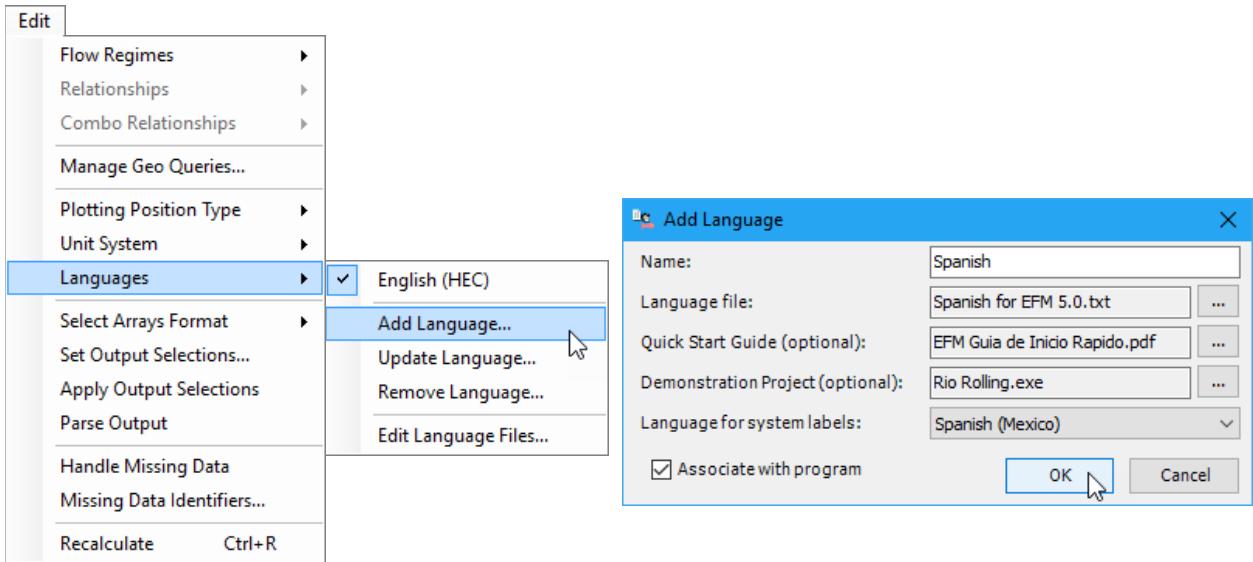
- *Language support.* Since EFM was first publically released, several suggestions have been offered regarding how particular features might be better labeled and documented to make them more intuitive. While this is a wonderfully simple and constructive idea, creating one ideal set of terms and descriptions is challenging because different teams have different preferences and lexicons. To empower study teams to make EFM as useful as possible, several features have been added that allow the software to be customized. In EFM 5.0, the software was further modified to allow users to specify interface labels. For individual users, this enables interface text to be changed to whatever is deemed most communicative. For international users, this enables translation of interface text.

In EFM, “languages” are comprised of: 1) name, 2) language file, 3) Quick Start Guide, 4) Demonstration Project, and 5) Language for system labels. Name is assigned by the user to identify the language. Language file is a text file that contains all interface labels. Quick Start Guide and Demonstration Project are file and pathname pointers to customized or translated versions of EFM user guidance and demonstration projects. Language for system labels offers users a choice of language and dialect, which is then used by EFM to determine format of numeric output in results tables. EFM 5.0 has a default language named “English (HEC)” that uses labels from a version-specific default language file entitled “EFMLanguage\_HEC.txt”.



```
EFMLanguage_HEC.txt - Notepad
File Edit Format View Help
00000=OK
00001=Cancel
00002=Apply
00003>Select time series record file
00004=DSS files
00005=Text files
00006=DAT files
00007=CSV files
00008=PRN files
00009=HDF files
00010=The selected flow regimes input file called
00011=does not exist
00012=Use edit menu to rename
00013>New
00014=Ref
00015=Active
00016=Identifier
00017=filename
00018=Part A
00019=Part B
00020=Part C
00021=Part E
00022=Part F
00023=Starting
00024=Ending
```

Languages can be added, updated, and removed. New languages will appear alphabetically in the languages list below the default language “English (HEC)”. Language names must be unique. Selecting the “*Add Language...*” menu option opens an interface where the parts and type of language are specified. Changing the language parts or type of an existing language is done through the “*Update Language...*” interface. Obsolete languages may be deleted via the “*Remove Language...*” interface.



A language file editor is accessible via the “*Edit Language Files...*” menu option. Editor allows users to open, create, edit, and close language files. The “*Allow Editing*” menu option controls whether open language files can be edited. Changes made to the language file of the active language are shown in software interfaces when that language file is saved via the editor.

**Edit Language Files**

Display default

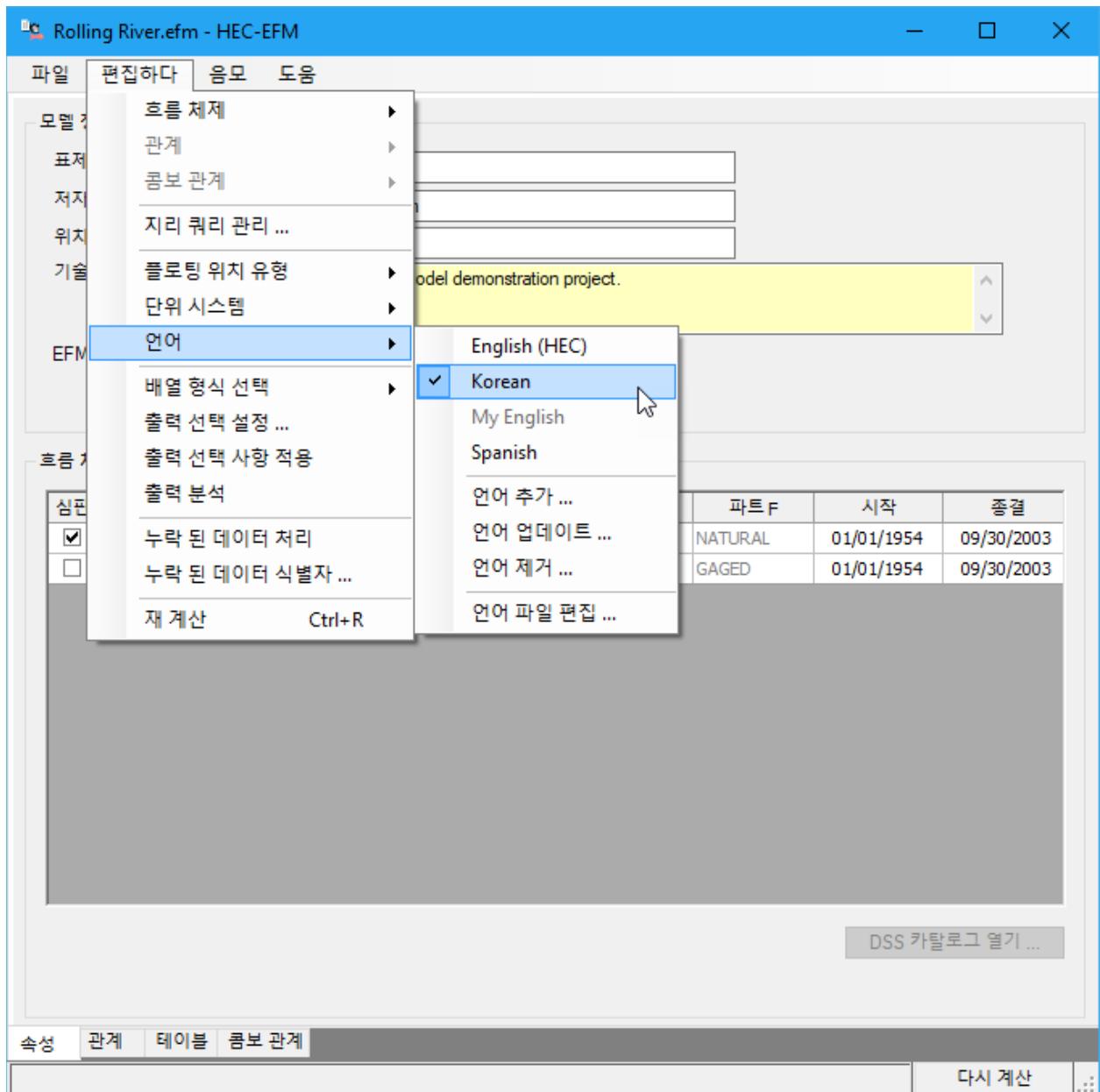
ID	EFMLanguage_HEC.txt (default)	My English.txt	Spanish for EFM 5.0.txt	Korean for EFM 5.0.txt
00000	OK	Yes	Okay	확인
00001	Cancel	Close	Cancelar	취소
00002	Apply	Save	Aplicar	대다
00003	Select time series record file	Select input	Seleccionar archivo de registro de series de tiempo	시계열 레코드 파일 선택
00004	DSS files	Data storage system	Archivos DSS	DSS 파일
00005	Text files	Text	Archivos de texto	텍스트 파일
00006	DAT files	DAT	Archivos DAT	DAT 파일
00007	CSV files	CSV	Archivos CSV	CSV 파일
00008	PRN files	PRN	Archivos PRN	PRN 파일
00009	HDF files	HDF	Archivos HDF	HDF 파일
00010	The selected flow regimes input file called	Flow regime input file:	El archivo de entrada de los regímenes de flujo seleccionados llamado	선택된 플로우 제제 입력 파일
00011	does not exist	missing	no existe	존재하지 않는다
00012	Use edit menu to rename	Go to edit menu	Use el menú de edición para renombrar	편집 메뉴를 사용하여 이름 바꾸기
00013	New	New	Nuevo	새로운
00014	Ref	Ref	Árbitro	심판
00015	Active	Selected	Activo	유호한
00016	Identifier	Name	Identificador	식별자
00017	Filename	File	Nombre del archivo	파일 이름
00018	Part A	A	Parte A	파트 A
00019	Part B	B	Parte B	파트 B
00020	Part C	C	Parte c	파트 C
00021	Part E	E	Parte E	파트 E
00022	Part F	F	Parte f	파트 F
00023	Starting	Start	Comenzando	시작
00024	Ending	End	Finalizando	종결

**Contextual Menu (Right-clicked on the table):**

- Open Language File...
- New Language File...
- Close Language File...
- Allow Editing
- Copy
- Clear
- Paste
- Cut
- Find Ctrl+F
- Find Next F4
- Find Prev Shift+F4
- Save
- Save As...

**Buttons:** OK, Cancel

Users are not required to use the language editor in EFM. Language files are simple text files that are compatible with many different software. Customized labels or translations can be made in web translators, word processors, spreadsheets, and other software. New labels can be saved directly to language files or pasted into EFM editor and then saved. Users may switch between languages whenever desired.



Please note that EFM has been developed exclusively on computers that use English (United States) as the active windows language. International users have encountered problems with EFM performance on computers that use other languages as the active windows language. It would be very difficult to thoroughly test the software for a wide selection of active windows languages.

International users are encouraged to apply EFM on computers with English (United States) as the active windows language. The language support features detailed here will allow EFM labels to be translated to the user's language of choice to assist with application.

## Improved Behaviors

- Several minor issues were identified and fixed, including assignment of prefixes and suffixes for EFM output naming conventions for compound flow regimes, missing tool tips, typos in HDF preprocessor, and application of reverse lookup ranges.
- An issue that led to increasing compute times for subsequent EFM runs of large applications was identified and fixed. The solution involved improvements to EFM's memory clearing related to the partitioning of large computes within one compute and between multiple computes.

## Documentation

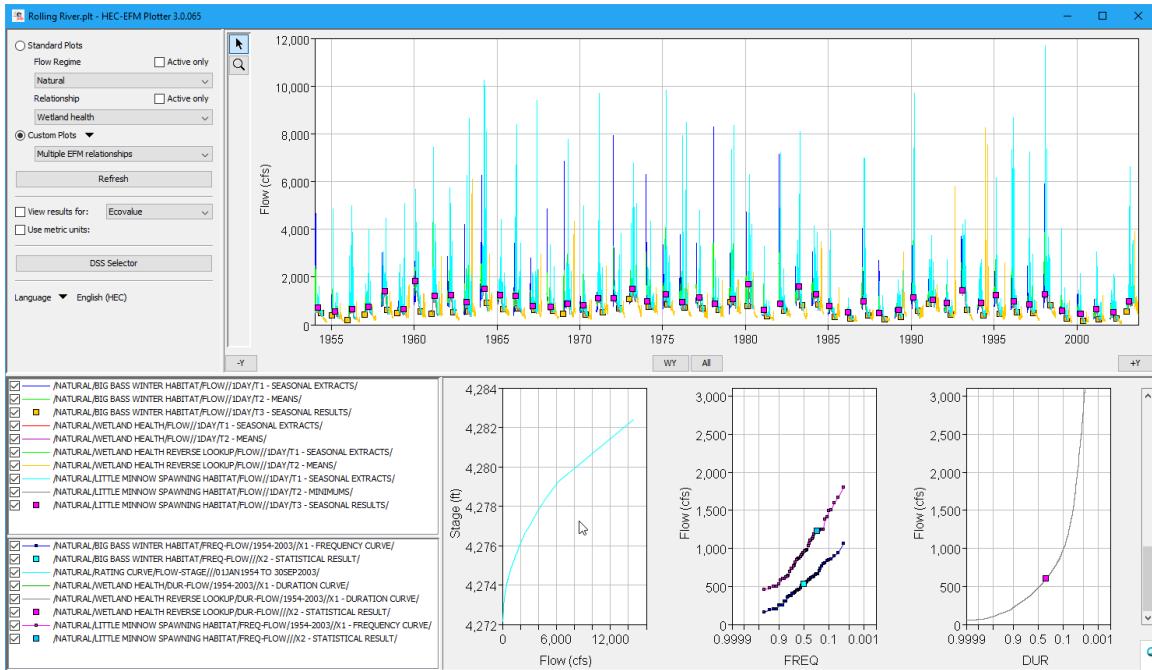
- The Quick Start Guide was updated to include descriptions of new features (sections added or revised: 3.7, 4.2.5, 5.3, and 6).

## HEC-EFM Plotter Status

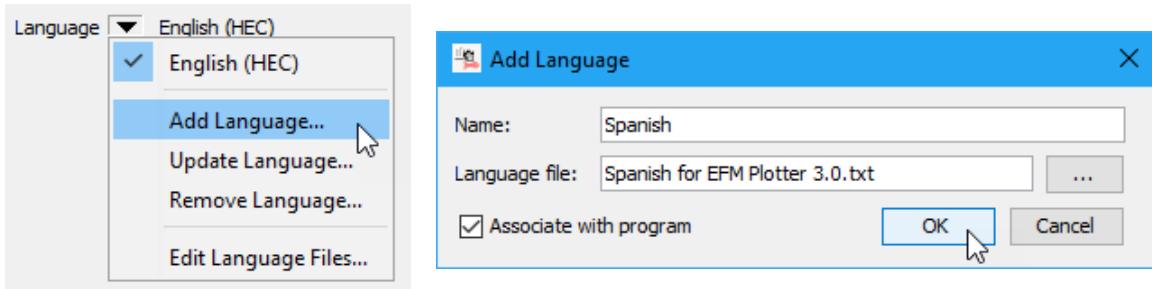
EFM Plotter helps users view EFM output and compare results. EFM and Plotter are separate software, but are intended for tandem use with Plotter opened via the “*Plot – Activate HEC-EFM Plotter*” menu option in EFM.

The latest version of Plotter (3.0) and corresponding release notes are available via HEC's website. Changes incorporated in that version are summarized here to provide a convenient status update for EFM readers. For more detail about changes to Plotter, please see the Plotter 3.0 release notes.

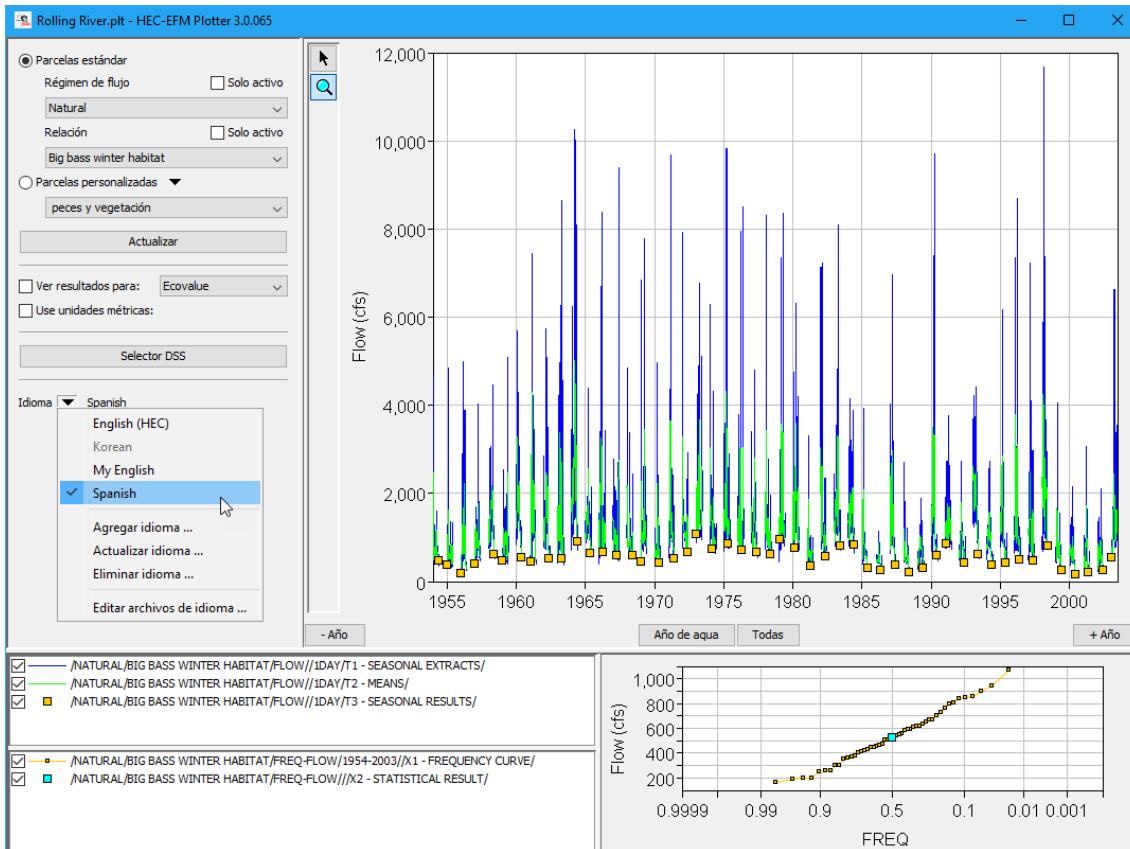
- *Paired data plots (new feature)*. A third paired data plot was reviewed, coded, and tested to allow plotting of an additional paired data type. This is useful when comparing results for multiple EFM relationships.



- *Language support (new feature).* Like EFM 5.0, Plotter 3.0 allows users to specify interface labels. For individual users, this enables interface text to be changed to whatever is deemed most communicative. For international users, this enables translation of interface text.



Customized labels or translations can be made in web translators, word processors, spreadsheets, and other software. New labels can be saved directly to language files or pasted into a language editor in Plotter and then saved. Users may switch between languages whenever desired.



- *Color management enhancements (improved behavior)*. Enhancements to “upon demand” color management were done to make Plotter more responsive to user commands especially when working with compound flow regimes, which can be comprised of ones, tens, or hundreds of thousands of parts.
- *Reverse lookup ranges (improved behavior)*. Reverse lookup range results were plotting oddly when results were out of range. Each case was different and problematic. These were all fixed.
- *Minor enhancements (improved behavior)*. Numerous improvements were made, including handling of blank DSS records and interface resizing to maximize plot areas for better result viewing.