

Releasing Scientific Software in GitHub: A Case Study on SWMM2PEST

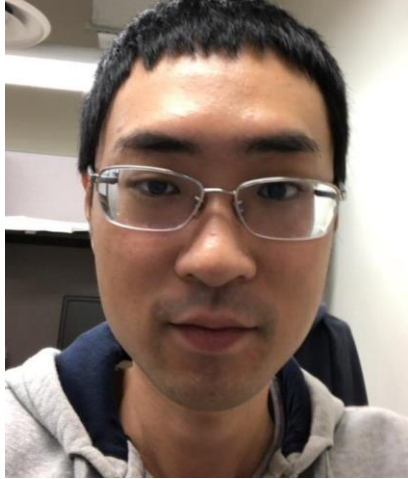
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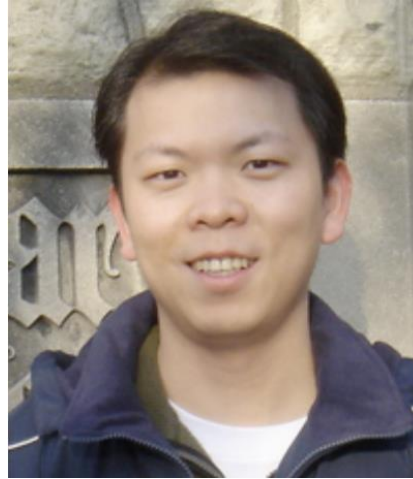
May 28, 2019

Acknowledgments



Xuanyi Lin

PhD Student
University of Cincinnati



Nan Niu

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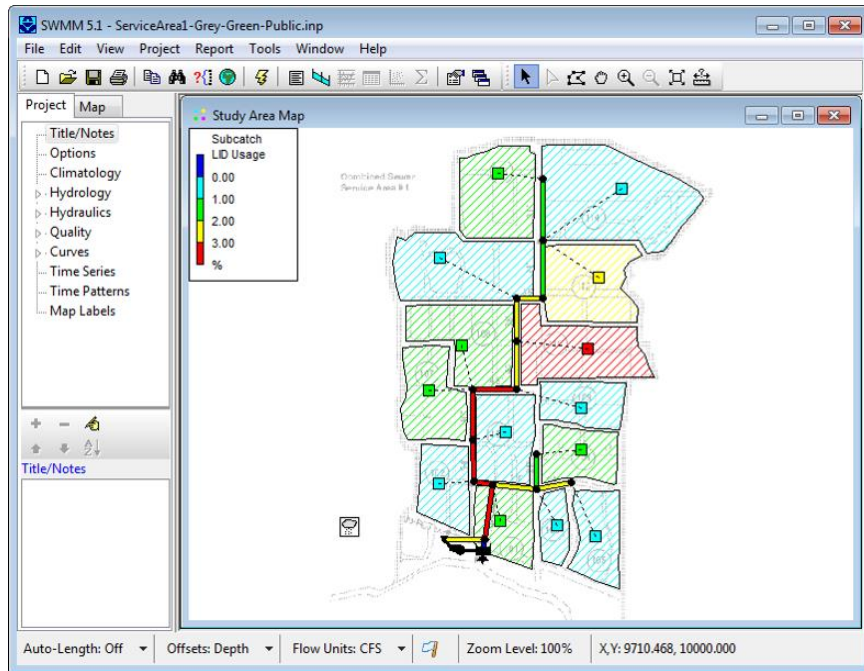


Michelle Simon

Associate Director
US EPA



Storm Water Management Model (SWMM)



Partial statistics on using SWMM for research in 2018 based on Google Scholar

<https://www.epa.gov/water-research/storm-water-management-model-swmm>

The scientific software we are releasing

SWMM2PEST

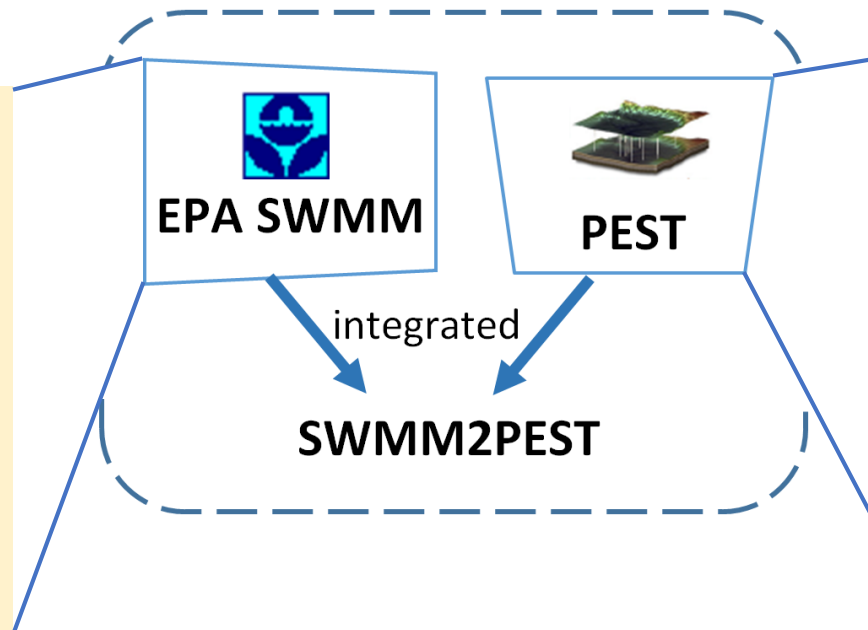
An integration of the SWMM and PEST scientific programs

Dynamic rainfall-runoff simulation model

Version 5.1.013 was released in 2018

Computational engine is written in C & the UI in Delphi.XE2

About 45,500 LoC



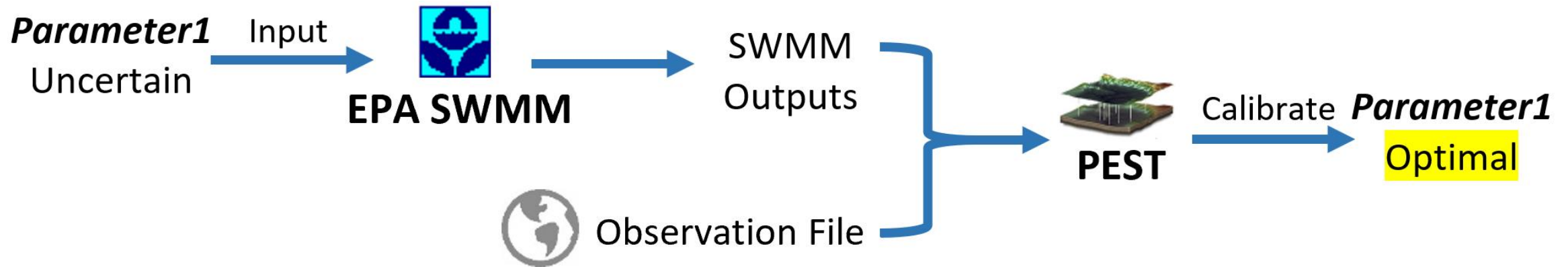
Model-Independent Parameter Estimation and Uncertainty Analysis

Version 15 was released in 2018

FORTRAN code

About 210,000 LoC

SWMM2PEST



SWMM2PEST: Automatic calibration for SWMM parameters

EPA concerns

Best practice of releasing scientific software?

SWMM2PEST 1.0 to 2.0

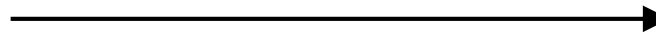
*Changes
around 50%*

Added & modified lines (source code)	Deleted lines (source code)	Added & modified UI files	Deleted UI files
1029	696	5	2



SWMM2PEST 1.0

Developed by Suraj Kamble
Python 3.5.4&PyQt 5
About 3,300 LoC



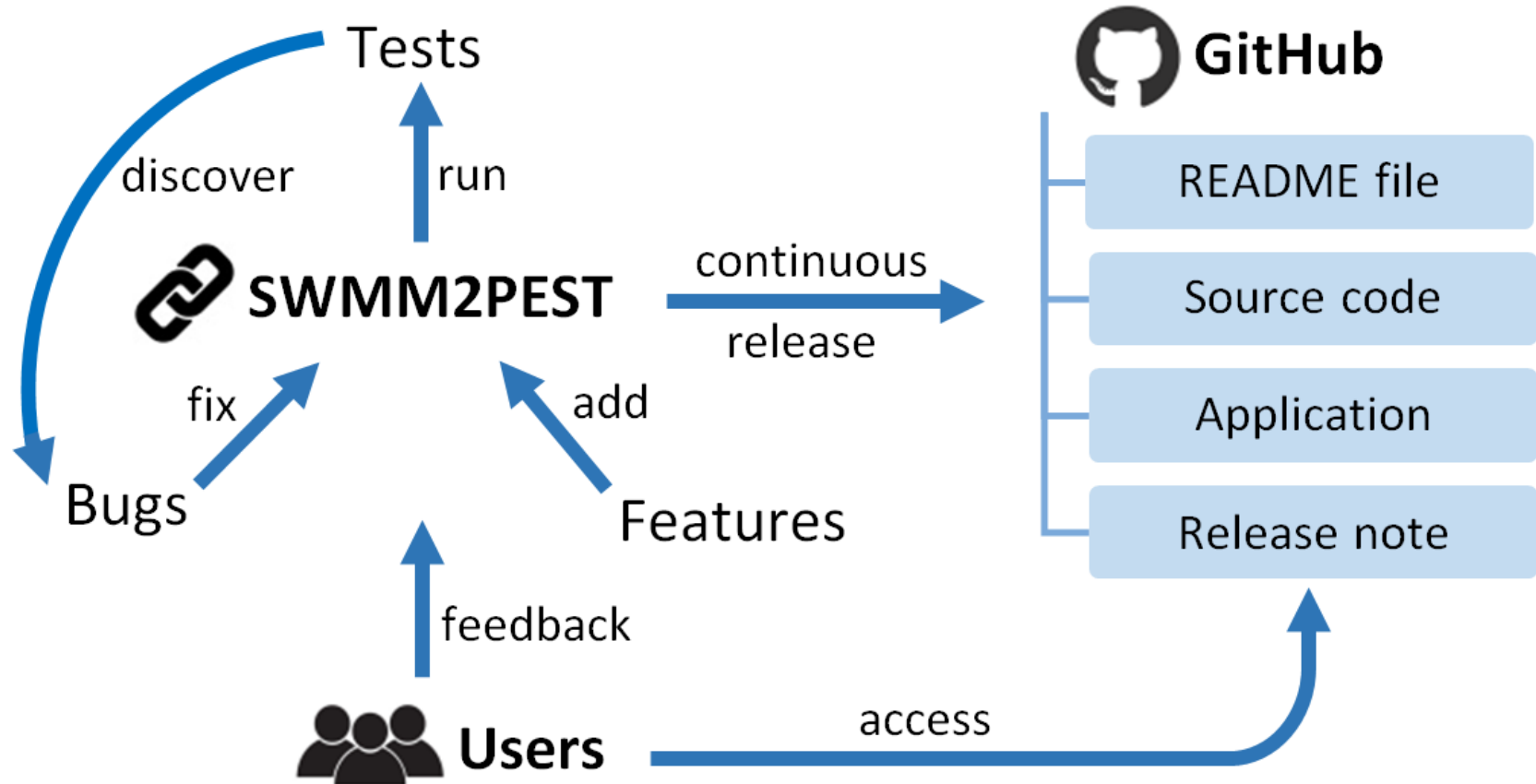
- ✓ Metamorphic testing
- ✓ Bugs fixed
- ✓ Restructured
- ✓ New features added



SWMM2PEST 2.0

Developed by Xuanyi Lin
Python 3.5.4&PyQt 5
About 3,200 LoC

Release workflow



GitHub-driven release process

Releasing in GitHub

README.md

SWMM2PEST

SWMM2PEST is a science...

Purpose & Motivation

Hydrologists and engineers use Parameter ESTimation back and forth and recalibration process of...

Introduction

SWMM2PEST 2.0 is a fixed lots of bugs, add...

References

SWMM: <https://www...>
PEST: <http://www.pes...>

Note that both SWMM 5.1.013.

How to run

A. Run in Pycharm

1. Run MainFrame.py.

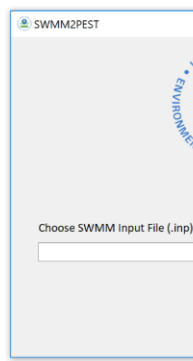
B. Run as Windows application

1. Download [SWMM2PEST](#).
2. Unzip the file.
3. Run SWMM2PEST.exe

How to use

A. Input File Selection

1. Provide SWMM input
2. Click "Start".



Caveats

1. Do not include the parameter with a value of 0 to do the calibratic
2. The folder path of the input file cannot contain spaces.
3. Same parameters in SWMM input file and observation file must be
4. Make sure the observation data format is the same format as the c contain date (mm/dd/yyyy), time (hh:mm:ss) and value, e.g. 01/30,

Project status

SWMM2PEST 2.0: June 2018

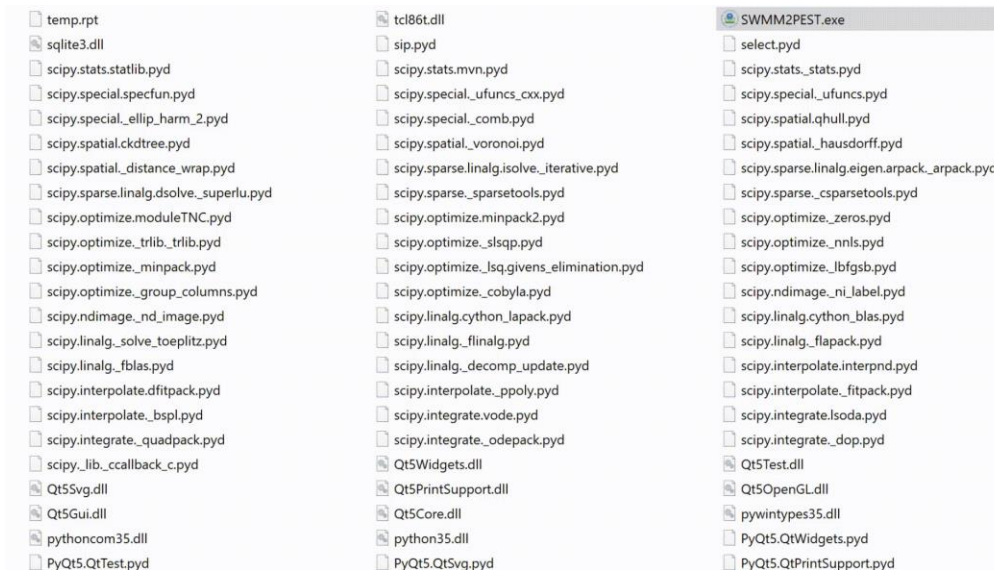
[SWMM2PEST](#): August 2017

Contributing

Everyone is welcome to contribute to this project.

README file

Demo



Categorizing the Content of GitHub README Files

Gede Artha Azriadi Prana¹  · Christoph Treude² · Ferdian Thung¹ · Thushari Atapattu² · David Lo¹

Releasing in GitHub

The screenshot shows the GitHub repository page for `XuanyiLin / SWMM2PEST2.0`. The navigation bar includes `Code`, `Issues 2`, and `Pull requests 0`. A search filter overlay is active, showing the search query `is:open is:issue` and a yellow highlight with the word `feedback`. The overlay also displays a list of issues:

- 2 Open ✓ 7 Closed
- Additional Criteria**
#9 opened 11 days ago by michelleannesimon
- Add PBIAS and RSR to SWMM2PEST**
#8 opened 11 days ago by michelleannesimon

The repository content shows a commit history with 32 commits and a file tree including `Core`, `Images`, `Py_UI_Files`, `Testing`, `UI_Files`, and `README.md`.

Source Code

The screenshot shows the GitHub release page for `SWMM2PEST 2.1`. The release was made by `XuanyiLin` on Nov 29, 2018, with 8 commits to master since this release. The release notes list the following changes:

1. Adapt SWMM to the latest version of SWMM 5.1.13
2. Update observation data format
3. Add functions for observation data
4. Update calibration UI
5. Update help document
6. Fix bugs

The `Assets` section includes:

- `example.zip` (142 KB)
- `SWMM2PEST.V2.1.zip` (84.6 MB)
- `Source code (zip)`
- `Source code (tar.gz)`

Below this, the `SWMM2PEST 2.0` release is shown, released on Oct 5, 2018, with 33 commits to master since this release. Its `Assets` section includes:

- `SWMM2PEST_V2.0.zip` (78.3 MB)
- `Source code (zip)`
- `Source code (tar.gz)`

Release software

Strategy 1: Changes between versions

	SWMM2PEST	SWMM2PEST	SWMM2PEST
		1.0	2.0
			2.1
SWMM2PEST	SWMM	5.1.10	5.1.13
	PEST	13.3	14.2

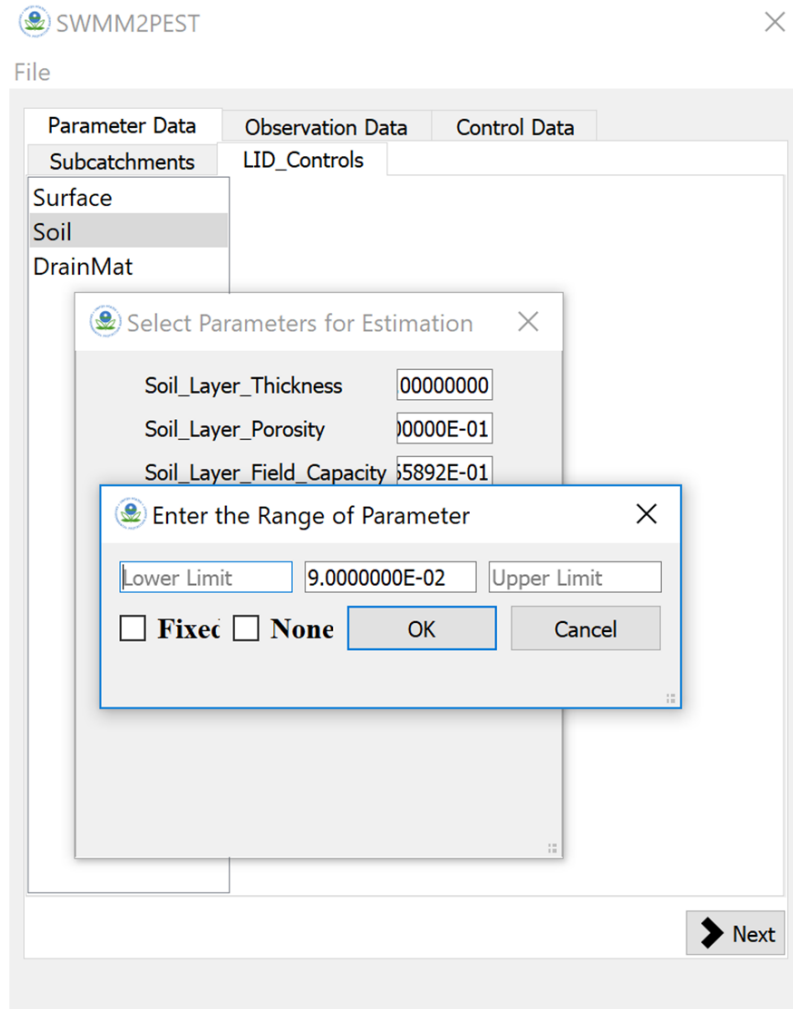
SWMM5 LID Report File					SWMM5 LID Report File				
Project:					Project:				
LID Unit: GreenRoof in Subcatchment FS10					LID Unit: GreenRoof in Subcatchment FS10				
Elapsed Time Hours	Total Inflow in/hr	Total Evap in/hr	Surface Infil in/hr		Date	Time	Elapsed Time Hours	Total Inflow in/hr	
JAN-06-2009	10:40:00	0.00	0.0000		01/06/2009	10:40:00	0.083	0.000	
JAN-06-2009	10:45:00	0.00	0.0000		01/06/2009	10:45:00	0.167	0.000	
JAN-06-2009	10:50:00	0.00	0.0000		01/06/2009	10:50:00	0.250	0.000	
JAN-06-2009	10:55:00	0.00	0.0000		01/06/2009	10:55:00	0.333	0.000	
JAN-06-2009	11:00:00	0.00	0.0000		01/06/2009	11:00:00	0.417	0.000	
JAN-06-2009	11:05:00	0.00	0.0000		01/06/2009	11:05:00	0.500	0.000	
JAN-06-2009	11:10:00	0.00	0.0000		01/06/2009	11:10:00	0.583	0.000	
JAN-11-2009	15:00:00	0.00	0.0000		01/13/2009	00:00:00	157.417	0.000	
JAN-11-2009	15:05:00	0.00	0.0000		01/13/2009	00:05:00	157.500	0.000	
JAN-11-2009	15:10:00	0.00	0.0000		01/20/2009	09:00:00	334.417	0.000	
JAN-11-2009	15:15:00	0.00	0.0000		01/20/2009	09:05:00	334.500	0.120	
JAN-11-2009	15:20:00	0.00	0.0000		01/20/2009	09:10:00	334.583	0.000	
JAN-11-2009	15:25:00	0.00	0.0000		01/24/2009	22:25:00	443.833	0.000	
JAN-11-2009	15:30:00	0.00	0.0000		01/24/2009	22:30:00	443.917	0.120	
JAN-11-2009	15:35:00	0.00	0.0000		01/24/2009	22:35:00	444.000	0.000	

SWMM
5.1.10

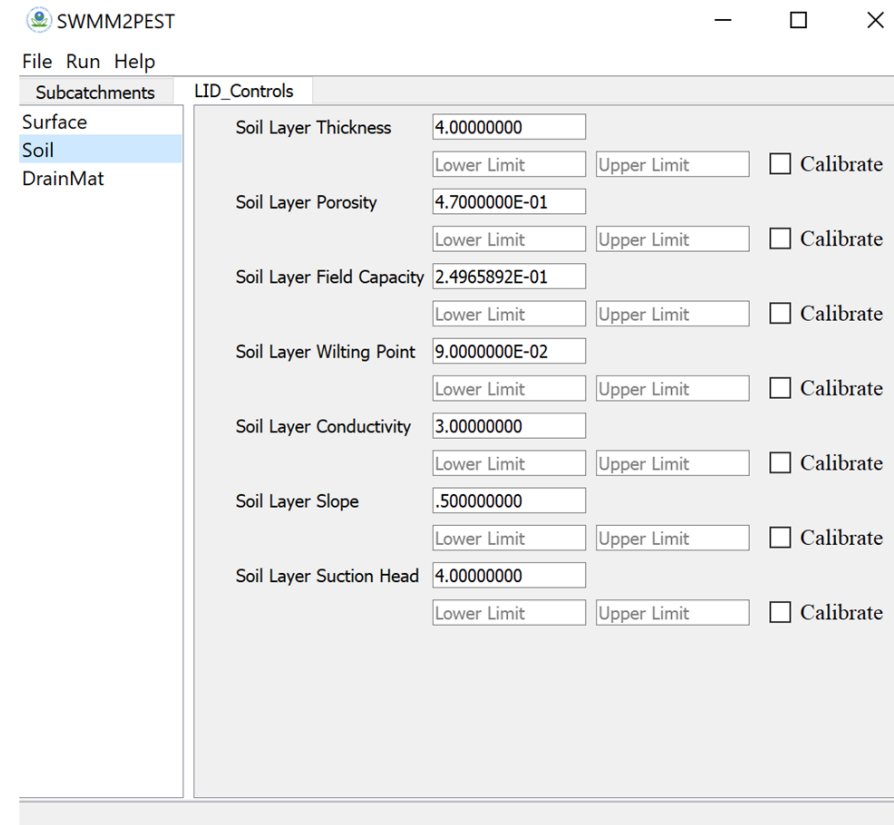
4 places differed

SWMM
5.1.13

Strategy 2: Improvements as requirements change



*SWMM2PEST
1.0 UI*



*SWMM2PEST
2.0 UI*

Insights

- Release as *required*
- **Connector** versus **connectee** release
SWMM2PEST *SWMM & PEST*
- Release to help automated *testing*

Future work

- Investigate other repositories
- Continuous release with more comprehensive user feedback and other developers' opinions

Thank you

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A Case Study on SWMM2PEST

