2011 International SWAT Conference

Soil and Water Assessment Tool

Past, Present and Future

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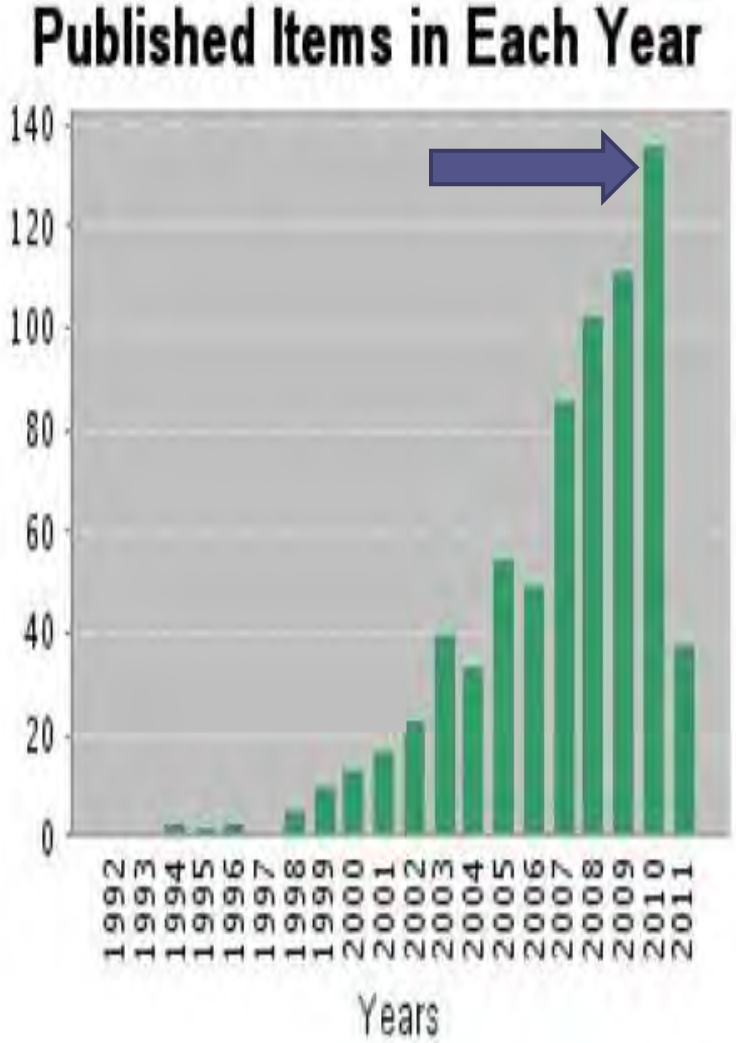
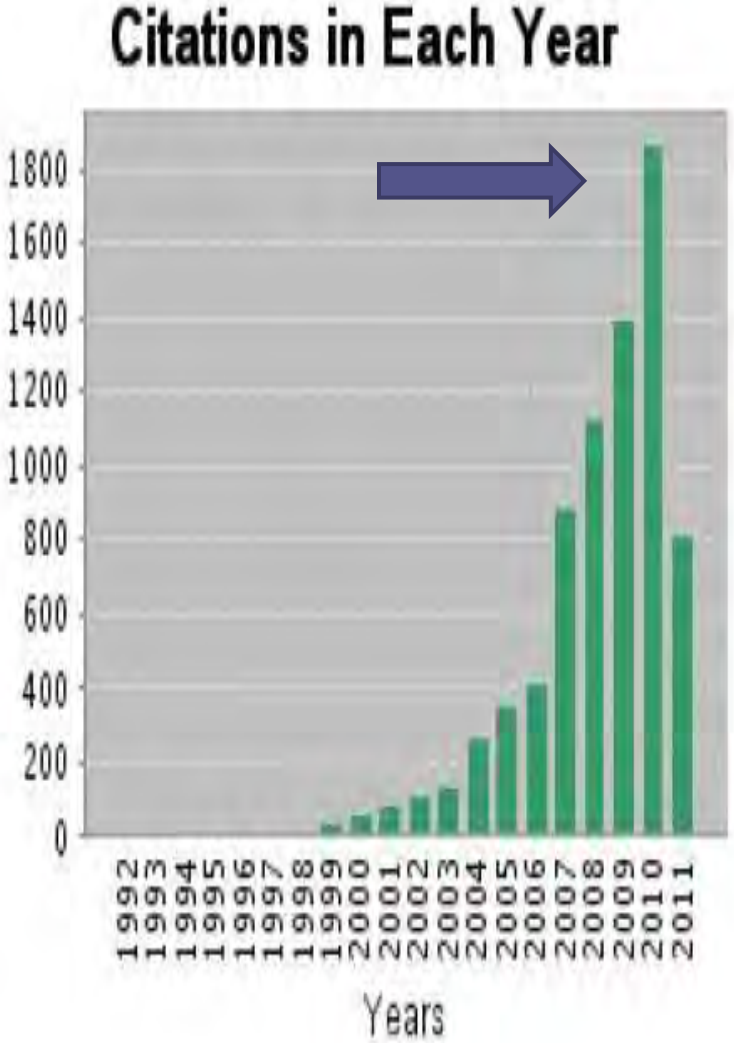
Texas A&M University

2011 International SWAT Conference

- 14th International SWAT conference since 2001
- Nearly **65** participants in three SWAT Workshops (Monday & Tuesday)
- More than **170** Conference Participants:
  - Representing 37 countries
  - 6 continents
  - 13 poster presentations
  - 120 oral presentations

SWAT H-Index





Results found: 738

Sum of the Times Cited [?] : 7,657

View Citing Articles

View without self-citations

Average Citations per Item [?]: 10.38

h-index [?]: 40

Source: ISI Web of Knowledge, May 2011

Top 10 Most Cited SWAT Papers

		Citations per year						
		2006	2007	2008	2009	2010	Total	Mean
1	**Large area hydrologic modeling and assessment - Part 1: Model development** Author(s): Arnold JG, Srinivasan R, Muttiah RS, et al. JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION Volume: 34 Issue: 1 Pages: 73-89 Published: FEB 1998	61	100	109	122	50	643	45.93
2	**SWAT2000: current capabilities and research opportunities in applied watershed modelling** Author(s): Arnold JG, Fohrer N HYDROLOGICAL PROCESSES Volume: 19 Issue: 3 Special Issue: Sp. Iss. SI Pages: 563-572 Published: FEB 28 2005	23	33	42	51	15	175	25
3	**Validation of tbe swat model on a large river basin with point and nonpoint sources** Author(s): Santhi C, Arnold JG, Williams JR, et al. JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION Volume: 37 Issue: 5 Pages: 1169-1188 Published: OCT 2001	20	26	23	25	15	165	15
4	**The soil and water assessment tool: Historical development, applications, and future research directions** Author(s): Gassman PW, Reyes MR, Green CH, et al. TRANSACTIONS OF THE ASABE Volume: 50 Issue: 4 Pages: 1211-1250 Published: JUL-AUG 2007	0	20	45	63	30	157	31.4
5	**Model evaluation guidelines for systematic quantification of accuracy in watershed simulations** Author(s): Moriasi DN, Arnold JG, Van Liew MW, et al. TRANSACTIONS OF THE ASABE Volume: 50 Issue: 3 Pages: 885-900 Published: MAY-JUN 2007	1	18	30	72	26	147	29.4
6	**Integratiion of basin-scale water-quality model with GIS** Author(s): Srinivasan R, Arnold JG WATER RESOURCES BULLETIN Volume: 30 Issue: 3 Pages: 453-462 Published: MAY-JUN 1994	4	8	6	2	2	119	6.61
7	**Development and test of a spatially distributed hydrological water quality model for mesoscale watersheds** Author(s): Krysanova V, Muller-Wohlfeil DI, Becker A ECOLOGICAL MODELLING Volume: 106 Issue: 2-3 Pages: 261-289 Published: MAR 1 1998	11	17	10	12	6	115	8.21
8	**Estimating hydrologic budgets for three Illinois watersheds** Author(s): Arnold JG, Allen PM JOURNAL OF HYDROLOGY Volume: 176 Issue: 1-4 Pages: 57-77 Published: MAR 1 1996	16	11	16	10	3	105	6.56
9	**Automatic calibration of a distributed catchment model** Author(s): Eckhardt K, Arnold JG JOURNAL OF HYDROLOGY Volume: 251 Issue: 1-2 Pages: 103-109 Published: SEP 15 2001	20	12	11	15	10	91	8.27
10	**A global sensitivity analysis tool for the parameters of multi-variable catchment models** Author(s): van Griensven A, Meixner T, Grunwald S, et al. JOURNAL OF HYDROLOGY Volume: 324 Issue: 1-4 Pages: 10-23 Published: JUN 15 2006	8	10	19	37	14	89	14.83

as of May 2011

Top 10 Authors Published

View Records
Exclude Records

Field: Author	Record Count	% of 1022	Bar Chart
ARNOLD, JG	68	6.6536 %	
SRINIVASAN, R	55	5.3816 %	
VAN GRIENSVEN, A	19	1.8591 %	
FOHRER, N	17	1.6634 %	
GASSMAN, PW	15	1.4677 %	
CHAUBEY, I	13	1.2720 %	
ENGEL, BA	13	1.2720 %	
FREDE, HG	13	1.2720 %	
BOSCH, DD	12	1.1742 %	
BOURAOUI, F	12	1.1742 %	

as of (1992-2011)

Top 10 Countries Published

Field: Country/Territory	Record Count	% of 1022	Bar Chart
USA	512	50.0978 %	
PEOPLES R CHINA	93	9.0998 %	
GERMANY	86	8.4149 %	
CANADA	65	6.3601 %	
NETHERLANDS	45	4.4031 %	
ITALY	41	4.0117 %	
ENGLAND	38	3.7182 %	
BELGIUM	37	3.6204 %	
FRANCE	37	3.6204 %	
INDIA	34	3.3268 %	

(1992-2011)

Top 10 Institutions Published

Field: Institution Name	Record Count	% of 1022	Bar Chart
USDA ARS	129	12.6223 %	
TEXAS A&M UNIV	61	5.9687 %	
PURDUE UNIV	37	3.6204 %	
CHINESE ACAD SCI	35	3.4247 %	
ARS	27	2.6419 %	
BEIJING NORMAL UNIV	24	2.3483 %	
IOWA STATE UNIV	22	2.1526 %	
TARLETON STATE UNIV	22	2.1526 %	
KANSAS STATE UNIV	21	2.0548 %	
UNIV FLORIDA	21	2.0548 %	

(1992-2011)

Top 10 Subject Areas Published

Field: Subject Area	Record Count	% of 1022	Bar Chart
WATER RESOURCES	443	43.3464 %	
ENVIRONMENTAL SCIENCES	294	28.7671 %	
GEOSCIENCES, MULTIDISCIPLINARY	207	20.2544 %	
ENGINEERING, ENVIRONMENTAL	145	14.1879 %	
AGRICULTURAL ENGINEERING	122	11.9374 %	
ENGINEERING, CIVIL	117	11.4481 %	
SOIL SCIENCE	89	8.7084 %	
ECOLOGY	83	8.1213 %	
AGRONOMY	68	6.6536 %	
METEOROLOGY & ATMOSPHERIC SCIENCES	46	4.5010 %	

(1992-2011)

Top 10 Journals Published

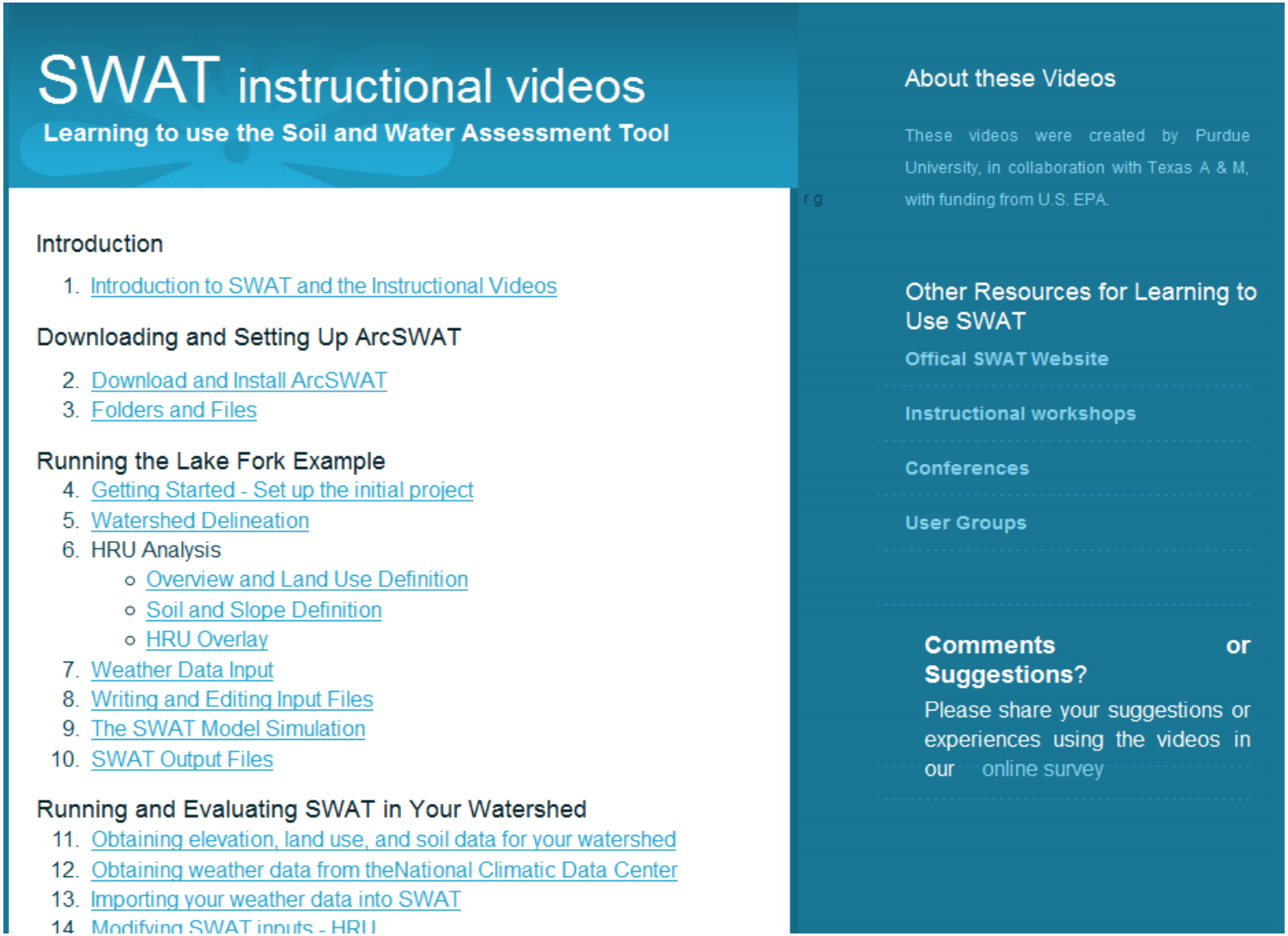
Field: Source Title	Record Count	% of 1022	Bar Chart
HYDROLOGICAL PROCESSES	65	6.3601 %	
JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION	63	6.1644 %	
TRANSACTIONS OF THE ASABE	63	6.1644 %	
JOURNAL OF HYDROLOGY	59	5.7730 %	
TRANSACTIONS OF THE ASAE	37	3.6204 %	
JOURNAL OF SOIL AND WATER CONSERVATION	35	3.4247 %	
AGRICULTURAL WATER MANAGEMENT	23	2.2505 %	
ECOLOGICAL MODELLING	21	2.0548 %	
ENVIRONMENTAL MODELLING & SOFTWARE	18	1.7613 %	
HYDROLOGICAL SCIENCES JOURNAL-JOURNAL DES SCIENCES HYDROLOGIQUES	18	1.7613 %	

(1992-2011)

Reaching out to increase worldwide SWAT Applications …

- Publish **Spanish Manuals** – theory and user input/output manuals *(Allan Jones and WB)*
- Publish **Chinese Theory Manual** *(Dr. Xuesong Zhang)*
- **Spanish Tutorial** – using ArcSWAT *(Natalia Uribe Rivera, CIAT – Columbia)*

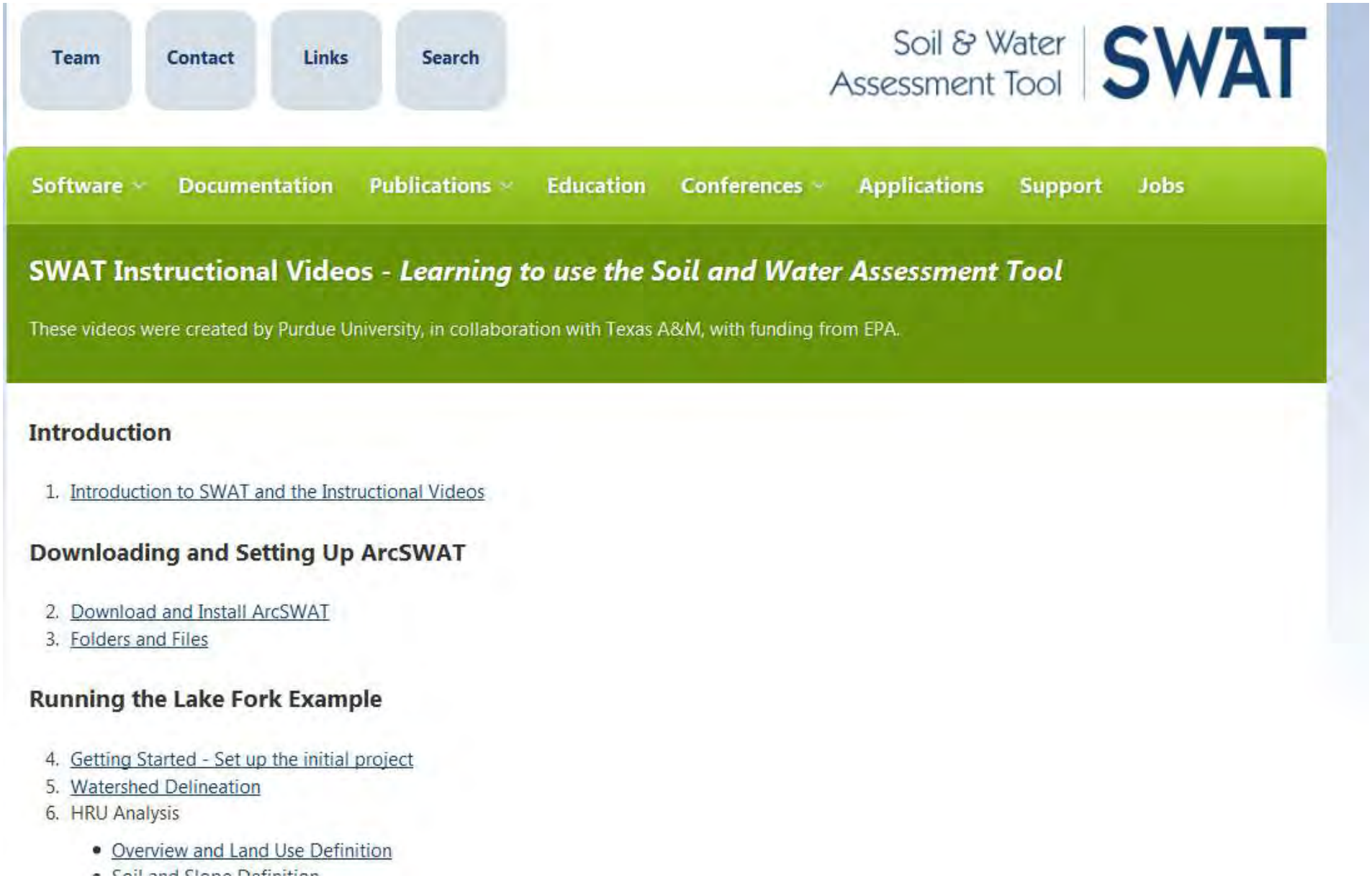
SWAT Tutorial Videos



developed by: **Dr. Jane Frankenberger**, *Purdue University*

funded by: U.S. EPA

SWAT Tutorial Videos



Team | Contact | Links | Search

Soil & Water Assessment Tool | SWAT

Software | Documentation | Publications | Education | Conferences | Applications | Support | Jobs

SWAT Instructional Videos - *Learning to use the Soil and Water Assessment Tool*

These videos were created by Purdue University, in collaboration with Texas A&M, with funding from EPA.

Introduction

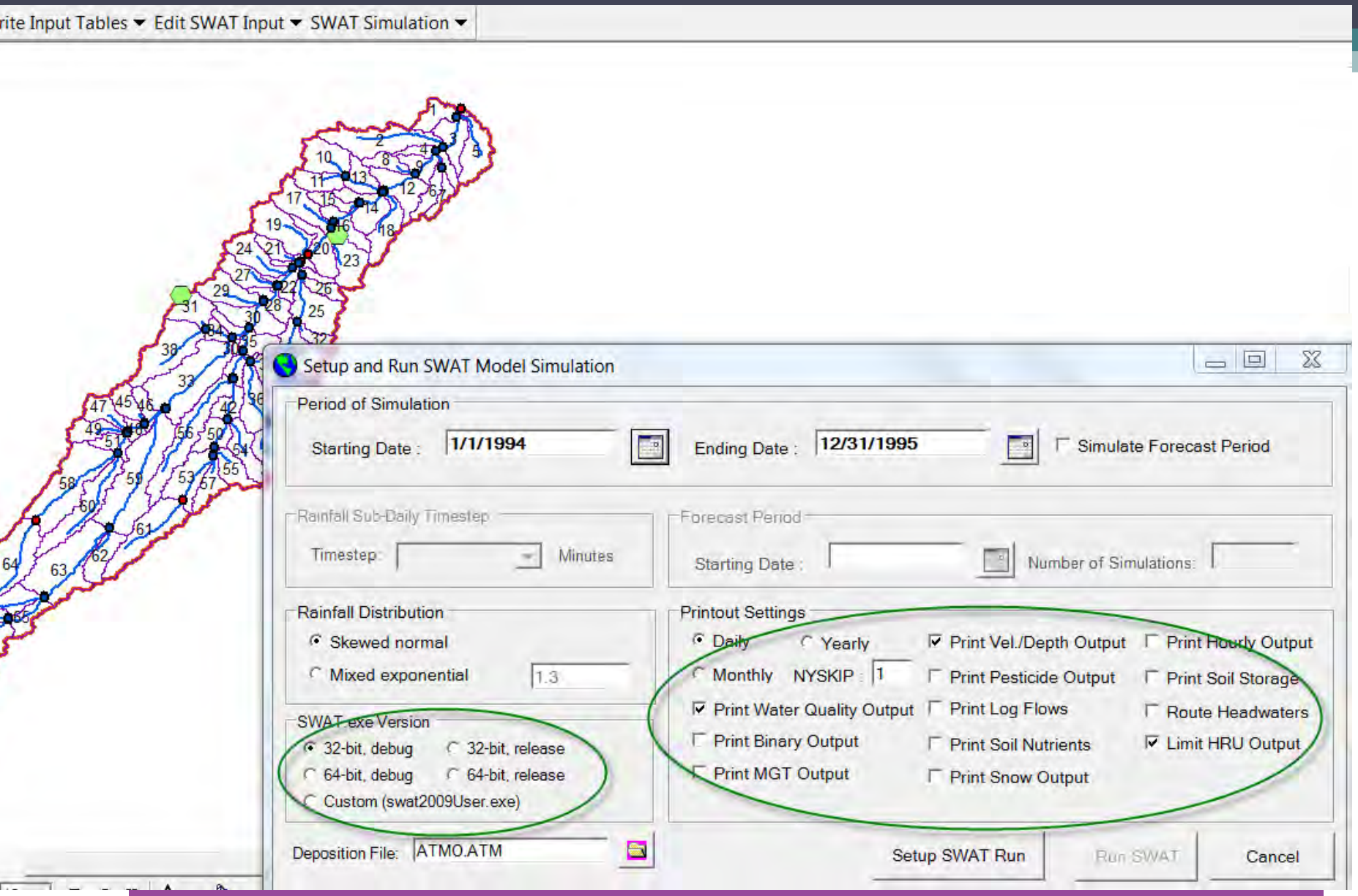
1. Introduction to SWAT and the Instructional Videos

Downloading and Setting Up ArcSWAT

2. Download and Install ArcSWAT
3. Folders and Files

Running the Lake Fork Example

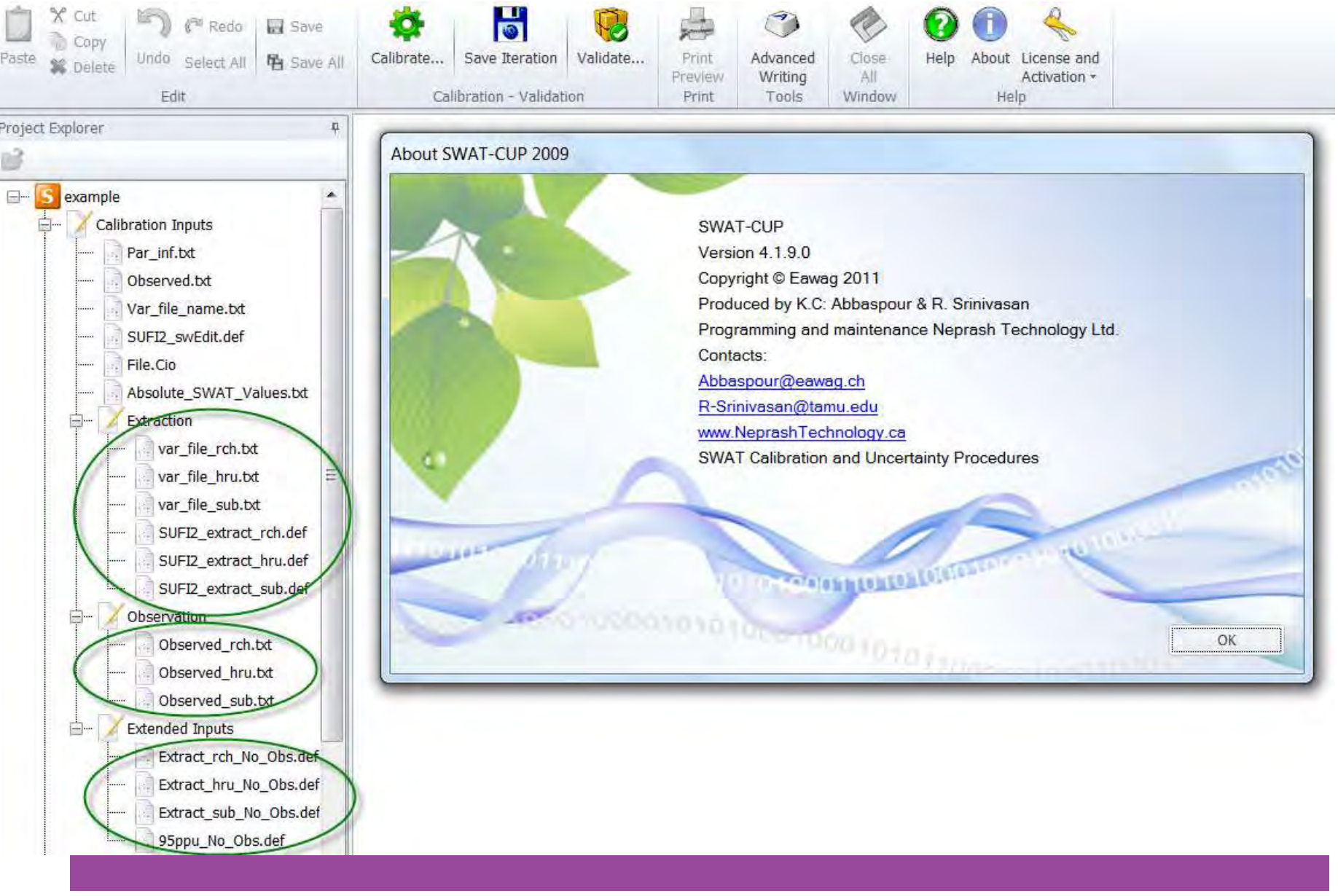
4. Getting Started - Set up the initial project
5. Watershed Delineation
6. HRU Analysis
    - Overview and Land Use Definition
    - Soil and Slope Definition


rite Input Tables
Edit SWAT Input
SWAT Simulation
Setup and Run SWAT Model Simulation
Period of Simulation
Starting Date :
1/1/1994
Ending Date :
12/31/1995
Simulate Forecast Period
Rainfall Sub-Daily Timestep
Timestep:
Minutes
Forecast Period
Starting Date :
Number of Simulations:
Rainfall Distribution
Skewed normal
Mixed exponential
1.3
Printout Settings
Daily
Yearly
Monthly
NYSKIP :
1
Print Vel./Depth Output
Print Hourly Output
Print Pesticide Output
Print Soil Storage
Print Water Quality Output
Print Log Flows
Route Headwaters
Print Binary Output
Print Soil Nutrients
Limit HRU Output
Print MGT Output
Print Snow Output
SWAT.exe Version
32-bit, debug
32-bit, release
64-bit, debug
64-bit, release
Custom (swat2009User.exe)
Deposition File:
ATMO.ATM
Setup SWAT Run
Run SWAT
Cancel

Future ArcSWAT Improvements

- ArcGIS 10 version of ArcSWAT is in development, will be ready for testing by July
- Significant improvement expected, including:
  - Moving weather tools under swatedit menu there by users can add validation period or climate change weather without needing to rewrite other input files
  - Include weather interpolation tools and nexrad/grid based weather input processing
  - Remove calibration/sensitivity tools from swat and arcswat and move to SWAT-CUP
  - Adding more variables and user variables with absolute limits to manual calibration tool

*Thanks to **Mike Winchell** and **Stone Environmental Inc.**, to accommodate most of the user group requests*


Paste
Cut
Copy
Delete
Undo
Redo
Select All
Save
Save All
Edit
Calibrate...
Save Iteration
Validate...
Calibration - Validation
Print Preview Print
Advanced Writing Tools
Close All Window
Help
About
License and Activation
Help
Project Explorer
example
Calibration Inputs
Par_inf.txt
Observed.txt
Var_file_name.txt
SUFI2_swEdit.def
File.Cio
Absolute_SWAT_Values.txt
Extraction
var_file_rch.txt
var_file_hru.txt
var_file_sub.txt
SUFI2_extract_rch.def
SUFI2_extract_hru.def
SUFI2_extract_sub.def
Observation
Observed_rch.txt
Observed_hru.txt
Observed_sub.txt
Extended Inputs
Extract_rch_No_Obs.def
Extract_hru_No_Obs.def
Extract_sub_No_Obs.def
95ppu_No_Obs.def
About SWAT-CUP 2009
SWAT-CUP
Version 4.1.9.0
Copyright © Eawag 2011
Produced by K.C: Abbaspour & R. Srinivasan
Programming and maintenance Neprash Technology Ltd.
Contacts:
Abbaspour@eawag.ch
R-Srinivasan@tamu.edu
www.NeprashTechnology.ca
SWAT Calibration and Uncertainty Procedures
OK

New Tool available on SWAT website

Setup | Hydrology | Sediment | Nitrogen Cycle | Phosphorus Cycle | Plant Growth | Nutrient Losses | Land Use Summary

Summary By Reported Landuse

LULC	AREAkm2	CN	AWCmm	USLE_LS	IRRmm	PRECmm	SURQmm	GWQmm	ETmm	SEDth	NO3kgh	ORGNkgh	BIOMth	YLDth
WWHT	346.7	83.86	230.74	1.51	2.93	724.15	62.34	7.69	591.63	5.73	0.67	8.79	12.69	3.32
AGRL	19.7	85.03	183.02	0.21	0.00	788.83	135.77	0.65	590.57	1.56	0.79	2.92	1.12	0.39
OATS	172.2	83.53	224.00	1.75	0.00	749.78	75.77	9.16	572.03	4.79	1.44	7.57	13.23	3.72
GRSG	84.4	85.13	227.41	1.89	0.00	709.22	60.08	3.72	614.02	3.91	1.23	9.21	14.52	2.19
CORN	84.4	85.13	227.41	1.89	0.00	709.22	60.08	3.46	666.82	4.23	0.99	9.24	32.16	12.39
PAST	254.3	82.89	191.94	2.49	0.00	789.41	88.91	6.12	646.66	1.18	4.04	2.16	3.55	0.00
FRST	113.5	77.52	179.04	2.72	0.00	829.44	81.16	27.85	585.12	0.06	0.37	0.07	17.72	0.00
BERM	2.4	85.71	242.44	0.65	0.00	715.10	122.36	0.00	575.56	0.09	0.49	0.65	0.67	0.00
JACH	39.7	82.49	201.08	2.71	0.00	732.79	56.37	7.51	567.53	0.09	0.16	0.23	0.43	0.00

Messages and Warnings

Crop: AGRL LESS THAN 5% OF WATER YIELD IS BASEFLOW
Crop: BERM BIOMASS MAY BE TOO LOW 0.7 Mg/Ha
Crop: BERM LESS THAN 5% OF WATER YIELD IS BASEFLOW
Crop: JACH BIOMASS MAY BE TOO LOW 0.4 Mg/Ha

Clay	4.93a	4.47a	2.00a	0.92a	0.50a	0.50a
Loam	4.05a	1.64b	5.78b	0.41b	0.18b	0.93a
Sand	2.74a	1.70ab	–**	1.50ab	0.07ab	–**

*For each nutrient form within a treatment, medians followed by a different letter are significantly different (α = 0.05).
**No particulate N or P data were available for sandy soils.

Pasture/Range	0.97	0.32	0.62	0.24	0.15	0.00
Various Rotations	3.68	3.12	1.36	0.59	0.80	0.60

From Harmel, D., et al. 2006 Compilation of Measured Nutrient Load Data for Agricultural Land Uses in the United States. Journal of the American Water Resources Association 42(5):1163-1178.

All Units mm

Future Tools…..

- Develop new Scenario tools at three user expertise level – Texas Team
- Scenario uncertainty tool for SWAT-CUP - Karim
- Sensitivity tool in SWAT-CUP - Karim
- SWAT on Grid computing systems – Karim, UNEP (Anthony Lehman) and others
- SWAT is OpenMI compliant (Ann van Griensven, UNESCO-IHE)
- SWAT CPU-parallel processing
- SWAT in R-statistical package (Jerry Whittaker, USDA-ARS)
- SWAT-GPU parallel processing using graphical processor, than CPU processor, up to 2000 processor on a desktop (Srini, TAMU)

Save the Date!

- **July, 16-20, 2012** – New Delhi (Drs. Gosain and Balaji)
- **April/May 2013** – Pattaya, Thailand (Drs. Manny and Samran)
- **July 2013** – Toulouse, France (Drs. Jose Miguel and Sabine)
- **2015** – Sardinia, Italy (Pierluigi Cau)

THANK YOU

Scientific Committee

- Karim Abbaspour
- Peter Allen
- Ann Van Griensven
- Jeff Arnold
- José María Bodoque del Pozo
- Pierluigi Cau
- Indrajeet Chaubey
- Nam-Won Kim
- Bouchra Haddad
- Nicola Fohrer
- Philip Gassman
- A.K. Gosain
- Jaehak Jeong
- Fanghua HAO
- Allan Jones
- Valentina Krysanova
- Taesoo Lee
- Pedro Chambel Leitão
- Antonio Lo Porto
- Francisco Olivera
- Manny Reyes
- José M. Sánchez-Pérez
- R. Srinivasan
- Martin Volk
- Michael Winchell
- Mike White

A WORLD OF THANKS …

SWAT Ambassadors

- Karim Abbaspour
- Peter Allen
- Ann Van Griensven
- Jeff Arnold
- José María Bodoque del Pozo
- Nam-Won Kim
- Nicola Fohrer
- Philip Gassman
- A.K. Gosain
- Fanghua HAO
- Allan Jones
- Valentina Krysanova
- Antonio Lo Porto
- Manny Reyes
- Michael Winchell

THANK YOU

Conference Sponsors

- *Jacobs Engineering Group Inc.*
- *The Madrid Institute for Advanced Studies in Water Technologies IMDEA Water*
- *The Ministry of Science and Innovation, Spain*
- *ARNAIZ Consultores*
- *US Department of Agriculture - Agricultural Research Service*
- *Texas AgriLife Research*
- *Texas A&M University*
- ***University of Castilla La Mancha, Campus of Fábrica de Armas***

Special THANKS to Ms. Jaclyn Tech and Ms. Courtney Smith

Sincere THANKS to
Jose Maria Bodoque and his team

GROUP PHOTO