

A dark blue world map is centered in the background of the slide. The text is overlaid on the map in a lighter blue and white color.

# The SWAT Literature Database: Overview of Database Structure and Key SWAT Literature Trends ([https://www.card.iastate.edu/swat\\_articles/](https://www.card.iastate.edu/swat_articles/))

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# Presentation Outline

- Provide background on origin/structure of database
  - some on-line demos after the presentation?
- Clarify the basis for as to which papers/models are included in the database
- Discuss trends in SWAT literature
- Some thoughts on the future of the database

# SWAT Review Articles

- Original literature list started by Dr. Manuel Reyes, North Carolina A&T Univ., Greensboro, NC
- Gassman, P.W., M. Reyes, C.H. Green, J.G. Arnold. 2005. SWAT Peer-Reviewed Literature: A Review. In: 2005 SWAT Conference Proceedings.
- Gassman, P.W., M.R. Reyes, C.H. Green, and J.G. Arnold. 2007. The Soil and Water Assessment Tool: Historical development, applications, and future research directions. Trans. ASABE. 50(4): 1211-1250.



# Trans. ASABE 2007 Review Article SWAT Literature Summary

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Primary Application Category	Hydrologic Only	Hydrologic & Pollutant	Pollutant Only
Calibration and/or sensitivity analysis	15	20	2
Climate change impacts	22	8	--
GIS interface descriptions	3	3	2
Hydrologic assessments	42	--	--
Delineation or input data effects	21	15	--
Comparisons with other models/methods	5	7	1
Interfaces with other models	13	15	6
Pollutant assessments	--	57	6

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# Current Structure of Database

- 1,700 total papers currently included
  - Limited to “peer-reviewed journal articles”
- Functions/information included:
  - option to upload citation data for papers
  - Readme (needs to be updated)
  - send message to database operators
  - citation lists by author or model & weblink to review articles
  - can download citation data for subsets of papers
  - Most abstracts not currently visible but DOI/URL links available for most papers
    - abstracts are included in searches
- Subdivided into broad, primary & secondary categories
  - users can search on any word/phrase of interest
  - also by journal, language, model name, publication year



# Broad Categories in Database

Category	Total papers	Category	Total papers
hydrologic only	781	pre-SWAT or SWAT-related	10
hydrologic & pollutant	643	crop/plant growth	7
pollutant only	129	computational approaches	6
review/history	62	BMP review or conceptual approach	5
interface tool and/or other software	20	carbon cycling	3
conceptual approach	16	watershed descriptions	3
data or component development	15		



# Models Represented in Database

- Vast majority of papers describe some sort of standard SWAT application
  - don't differentiate by specific version/release #
- Over 80 modified SWAT models in literature
  - identified in database by specific name or simply as "SWAT (Modified)"
- A few "Pre-SWAT or SWAT-Related" papers
  - Models that contributed key components or are closely related to SWAT (i.e., models from the Temple Labs)

# Example Modified SWAT Models

Name	Country	Description
SWATMOD	U.S. (Kansas)	SWAT and MODFLOW groundwater model interface
SWIM	Germany	Comprehensive water quality model developed from SWAT and MATSALU models
SWAT-G	Germany	Improved flow predictions for typical conditions in low mountain ranges in Germany
ESWAT	Belgium	“Extended” with sub-hourly time step, enhanced hydrology and in-stream components, and autocalibration options
SWAT <sub>BF</sub>	Canada	Better simulate processes within forested watersheds in the Canadian Boreal Plain
SWAT-K	South Korea	Multiple modified modules for Korean conditions; includes interfaces with the MODFLOW and SWWM models
SWAT-VSA	U.S. (Cornell Univ.)	Re-conceptualized model that simulates overland flow in ways consistent with variable source area hydrology
SWAT-CS	Canada	Improved flow predictions for Canadian Shield region
PCPF-1 @SWAT	Japan	Improved approach for simulating pesticide transport in rice paddies



# Pre-SWAT or SWAT-Related Models Cited in Database

- ALMANAC: Agricultural Land Management Alternative with Numerical Assessment Criteria
- APEX: Agricultural Policy/Environmental eXtender
- EPIC: Environmental Policy Integrated Climate
- GLEAMS: Groundwater Loading Effects of Agricultural Management Systems
- ROTO: Routing Outputs to the Outlet
- SWRRB: Simulator for Water Resources in Rural Basins

 Williams J.R., J.G. Arnold, J.R. Kiniry, P.W. Gassman and C.H. Green. 2008. History of model development at Temple, Texas. *Hydrol. Sciences Journal*. 53(5): 948-960. Doi: 10.1623/hysj.53.5.948.

# Distribution of Models in Database

Specific model or category	Total papers
SWAT	1492
ESWAT	9
SWAT-G	14
SWIM	31
SWAT (modified)	80
SWAT (modified) & SWAT	27
PRE-SWAT or SWAT-related***	12
PRE-SWAT or SWAT-related*** & SWAT	15
None	20



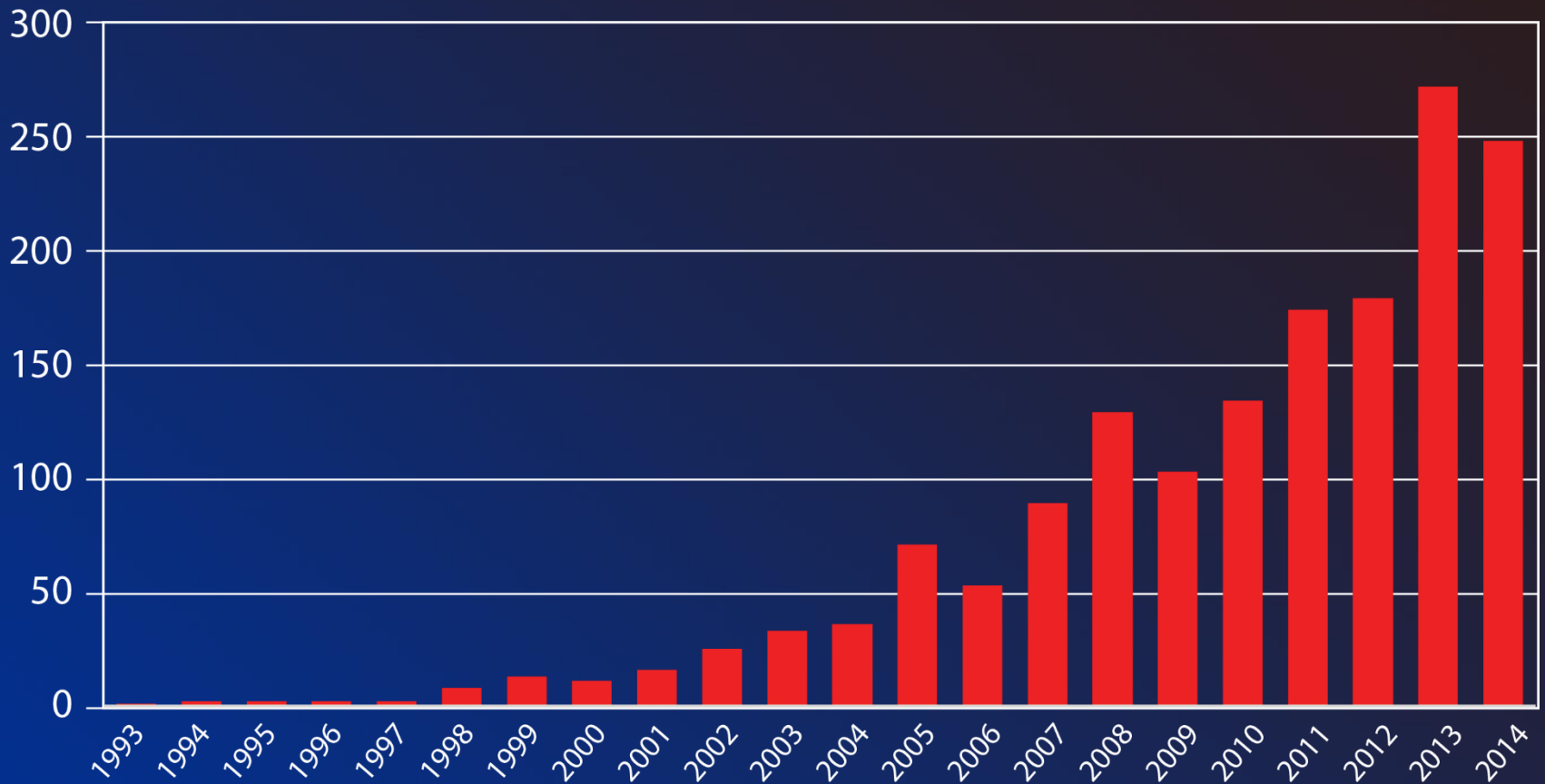
\*\*\* Includes ALMANAC, ALMANACBF, APEX, EPIC, GLEAMS, SWRRB, & ROTO

# Languages Represented in Database

Category	Total papers	Category	Total papers
English	1614	Indonesian	4
Chinese	35	German	3
Portuguese	15	Spanish & English	3
Korean	8	Basque	1
Spanish	6	Polish	1
Farsi	4	Romanian	1
French	4	Vietnamese	1



# Total English SWAT-related articles in SWAT Literature Database



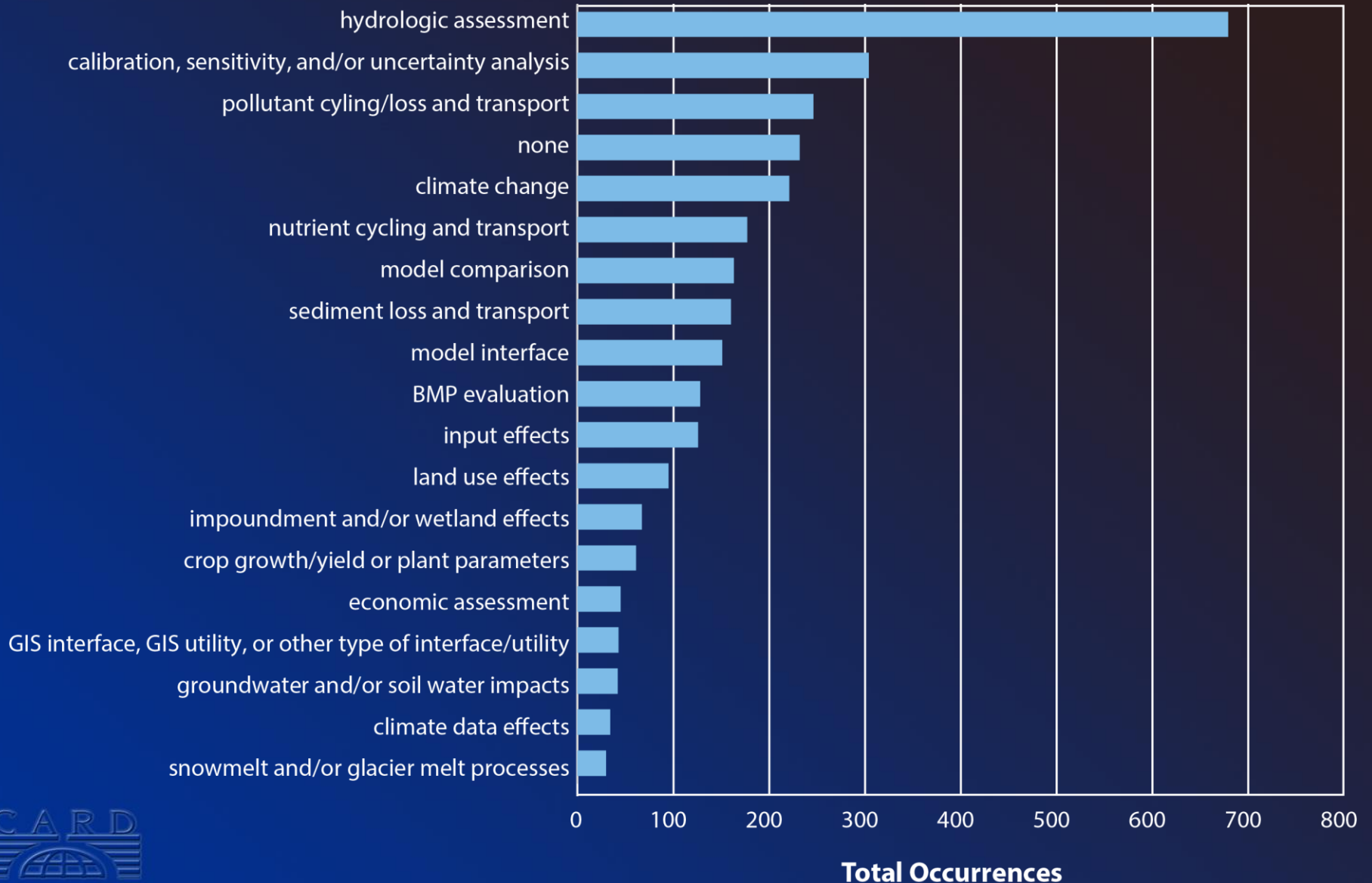
Source: [https://www.card.iastate.edu/swat\\_articles/](https://www.card.iastate.edu/swat_articles/); data shown here includes both SWAT and modified SWAT applications as well as review articles

# Primary & Secondary Categories

- Currently 45 primary/secondary categories
  - two have no entries so far
- Over 200 papers set as “none” for secondary category
- Some of the categories reflect important trends
  - e.g., crop growth results, modified curve number approaches, Green-Ampt method
- Subjective decisions used in categorizing papers
  - some papers could be categorized in 3 or more categories



# Top Combined Primary & Secondary Categories

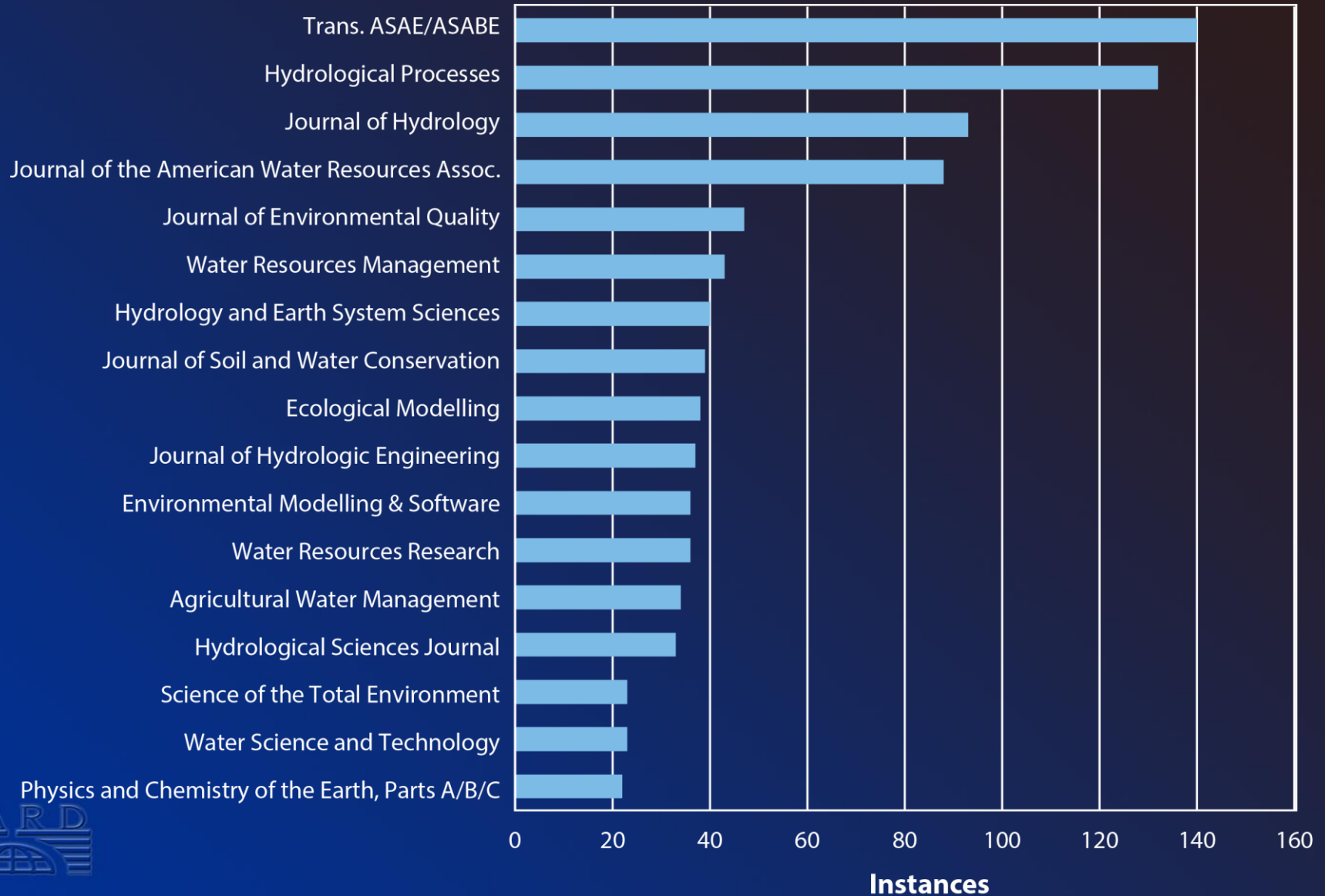


# Distribution of Journals

- A total of 386 journals included in current database
- Most published in English; some in other languages
- Assumed that the articles are published via a true peer-reviewed process
- Some of the papers published in journals published by so-called “Predatory Publishers”
  - see <http://scholarlyoa.com/publishers/>



# Journals with 20+ Papers in Current Database





# Thomson Reuters Web of Science Publication Citation Database

- Originally “The Science Citation Index (SCI)” created by Eugene Garfield / Inst. for Scientific Information (ISI) in 1964
- Useful background paper:
  - Bensman, S. 2007 . Garfield and the Impact Factor. *Annual Review of Information Science and Technology*. 41(1): 93–155. Doi: 10.1002/aris.2007.1440410110.
- Current Web of Science structure:
  - **Core Collection:** journals with impact factor
    - often still referred to as “ISI Web of Science” or “SCI Web of Science”
  - **All Databases:** citation data based on additional Citation databases (e.g., Biological Abstracts, CAB Abstracts, INSPEC, FSTA, MEDLINE)



# JSWC Article Describing Bibliometric Review of Nonpoint Source Modeling Research

- Citation: Li, S., Y. Zhuang, L. Zhang, Y. Du, and H. Liu. Worldwide performance and trends in nonpoint source pollution modeling research from 1994 to 2013: A review based on bibliometrics. *Journal of Soil and Water Conservation* 69(4): 121A-126A.
- Both authors of studies and terms in studies are ranked in JSWC article based on review of articles in Web of Science Core Collection
  - searched on terms in article titles, abstracts or keywords
  - a total of 2,179 nonpoint source (diffuse) pollution articles found; 148 were SWAT papers
  - SWAT: #4 key term and most widely used model
- Five indices used to rank authors
  - **total articles**, first or correspondence author, **total citations**, citations per publication, & author h-index based articles included in the analysis



# Influential “SWAT Authors” Among 30 Top Water Quality Modeling Authors in JSWC Article

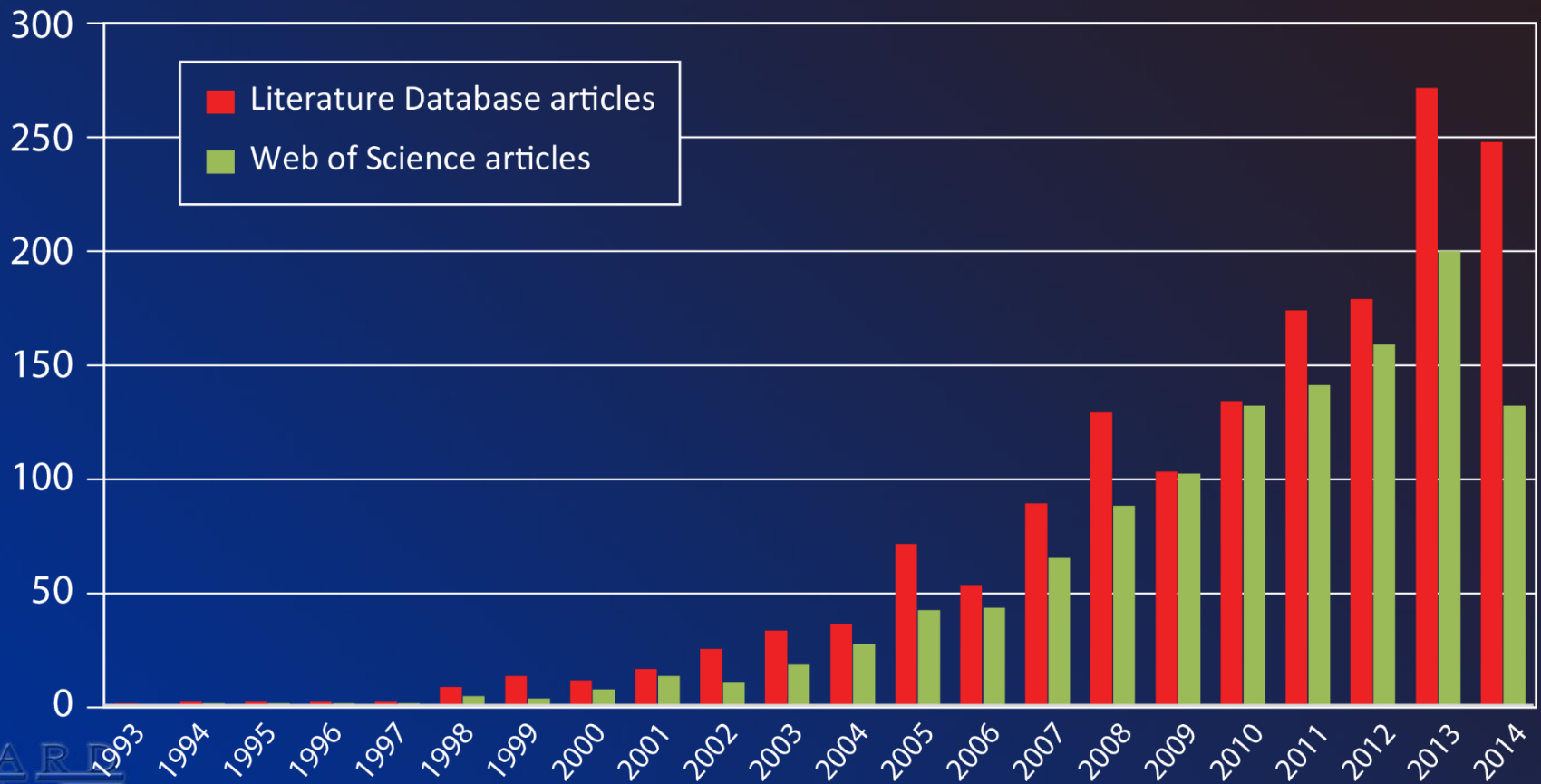
Rank	Author	Institution	Total Articles	Total Citations
1	J.G. Arnold	USDA-ARS	30	2415
2	R. Srinivasan	Texas A&M Univ.	27	2097
3	T.S. Steenhuis	Cornell Univ.	22	486
5	M.T. Walter	Cornell Univ.	20	399
14	F. Bouraoui	Comm. of European Communities	15	379
19	F.H. Hao	Beijing Normal Univ.	13	194
20	I. Chaubey	Purdue Univ.	12	238
21	Z.M. Easton	Virginia Tech Univ. (Cornell Univ.)	12	169
22	W. Ouyang	Beijing Normal Univ.	11	90

Source: Li et al. Worldwide performance and trends in nonpoint source pollution modeling research from 1994 to 2013: A review based on bibliometrics. Journal of Soil and Water Conservation 69(4): 121A-126A.



# SWAT Literature Database vs. Web of Science

Web of Science search structure in “All Databases” category:  
“Soil and Water Assessment Tool” [Topic] OR “SWAT Model” [Topic]



# Web of Science All-Time Top-Cited JAWRA Papers (July 28, 2014)

Authors	Year	Title	Model	Citations	
				All Databases	Core Collection
Arnold et al. (1)	1998	Large Area Hydrologic Modeling and assessment - Part 1: Model Development	SWAT	1,432 (GS: 2,724)	1,298
Santhi et al. (2)	2001	Validation of the SWAT Model on a Large River Basin with Point and Nonpoint Sources	SWAT	353	317
Arnold et al. (4)	1999	Automated Methods for Estimating Baseflow and Ground Water Recharge from Streamflow Records	-	280	251
Srinivasan et al. (11)	1998	Large Area Hydrologic Modeling and assessment - Part II: Model Application	SWAT	150	139



# Web of Science All-Time Top Cited Trans. ASAE/ASABE Papers (July 28, 2014)

Authors	Year	Title	Model	Citations	
				All Databases	Core Collection
Moriasi et al. (1)	2007	Model Evaluation Guidelines for Systematic Quantification of Accuracy in Watershed Simulations	SWAT	743	720
Gassman et al. (4)	2007	The Soil and Water Assessment Tool: Historical Development, Applications, and Future Research Directions	SWAT	527	490
Williams et al. (6)	1984	A Modeling Approach to Determining the Relationship Between Soil Erosion and Soil Productivity	EPIC	502	466
Williams et al. (10)	1989	The EPIC Crop Growth-Model	EPIC	361	333

# Summary of Top 50 Cited Web of Science Trans. ASABE Papers (July 28, 2014)\*

- Top-cited SWAT application or review papers
  - #s 1, 2, 7, 8, 9, 12, 13, 21, 27, 30, 32, 37
- Other papers with significant SWAT examples or discussions from 2006 TMDL special issue
  - #s 5, 6, 11
- APEX review paper – #38



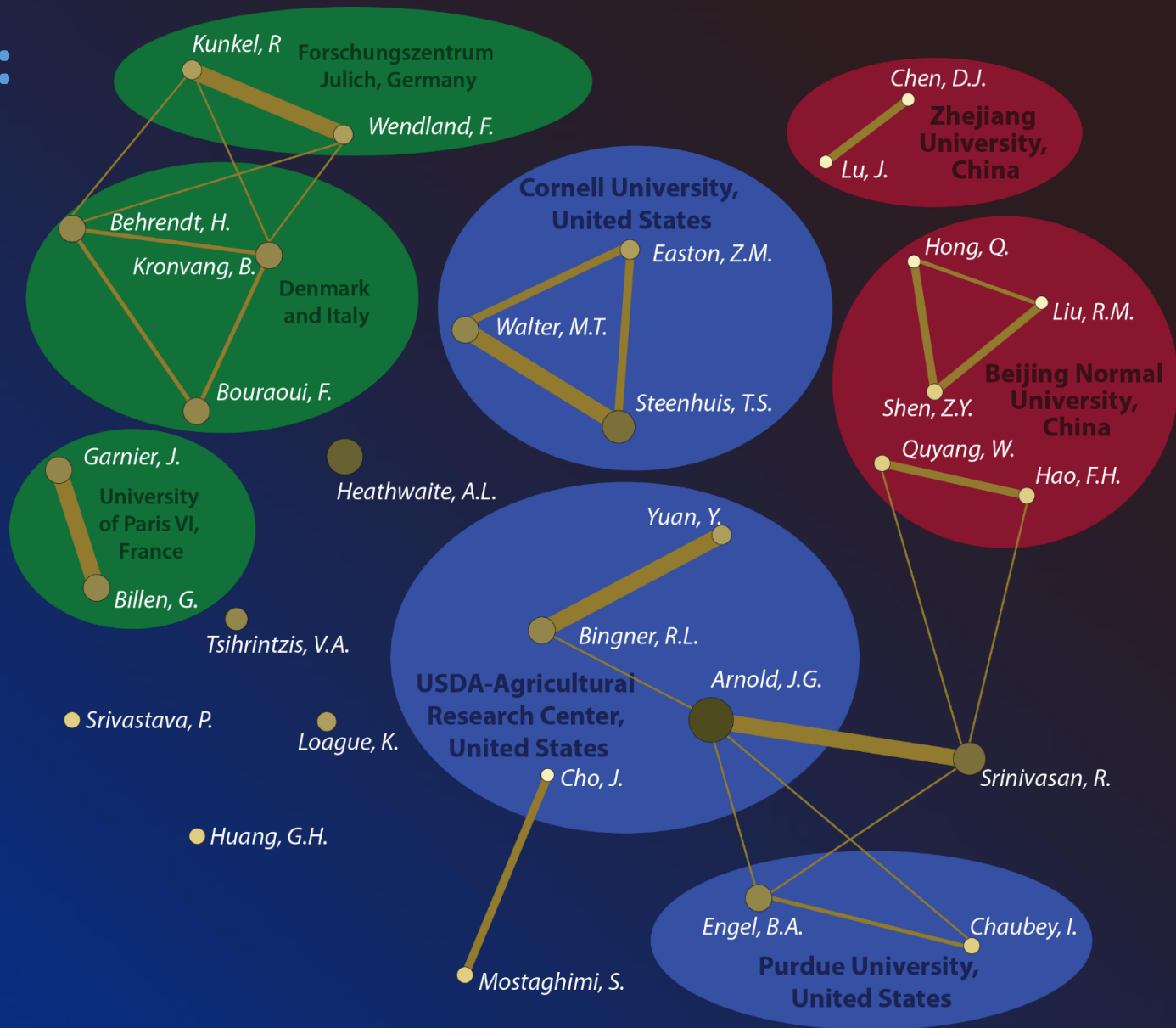
\*"B" was added for "Biological" in 2006 resulting in Trans. ASABE

# Some Concluding Thoughts

- SWAT literature is rapidly expanding
  - disciplines represented also continues to expand
  - ability to keep adding lots of future papers not guaranteed
- Creation of similar EPIC/APEX literature database?
- Users are encouraged to upload citation data and also identify typos/errors
- Any other feedback from users is welcome



# JSWC Article: Cooperation Among Authors



Source: Li et al. Worldwide performance and trends in nonpoint source pollution modeling research from 1994 to 2013: A review based on bibliometrics. *Journal of Soil and Water Conservation* 69(4): 121A-126A.



# Definition of “Quirky”

quirk·y: 'kwərkē/ (adjective)

**Definition: characterized by peculiar or unexpected traits**

**Synonyms: eccentric, idiosyncratic, unconventional, unorthodox, unusual, strange, bizarre, peculiar, odd, outlandish, zany**

