Agricultural Policy/Environmental eXtender

Recent Activities and Developments (2013-2017)

Jaehak Jeong
Associate Professor
Blackland Research and Extension Center
Texas A&M AgriLife Research

Thomas Gerik
Professor, Resident Director
Blackland Research and Extension Center
Texas A&M AgriLife Research

Outline

Activities

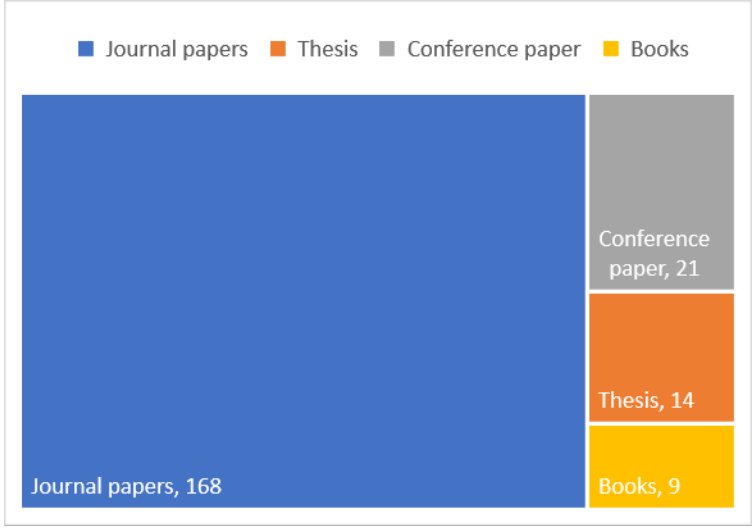
Bibliography (5 yrs)
Training workshop
User manuals
Supporting Tools

Research & Development

National Assessment of Conservation Practices
Bacteria fate and transport model
Preferential grazing model
Paddy/wetland simulation
Improved percolation simulation

APEX/EPIC Bibliography

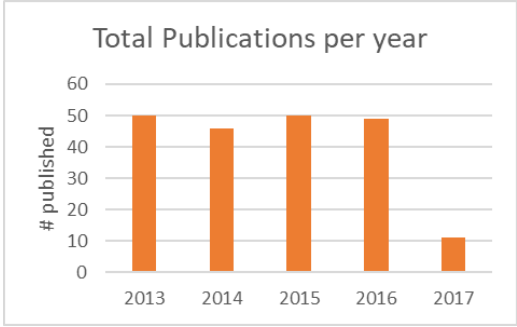
Search Period: 2013-2017



Google Scholar keyword searching

- Agricultural Policy Environmental Extender
- Environmental Policy Integrated Climate

Over 210 listings identified after manually inspected/filtered



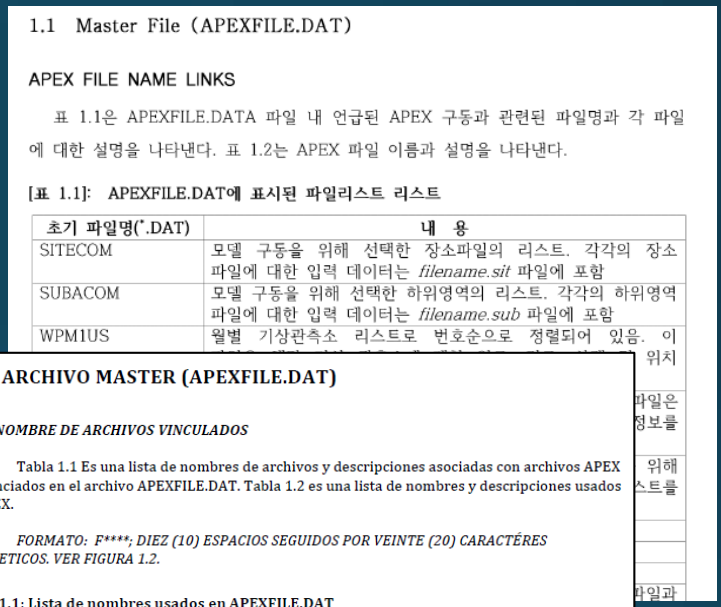
APEX/EPIC Bibliography (2013-2017)

Frequency of articles by journal	# papers
Transactions of the ASABE	11
Journal of Environmental Quality	11
Journal of Soil and Water Conservation	7
Agricultural Systems	7
Environmental Modelling & Software	6
Ecological Modelling	5
Agricultural Water Management	4
Agriculture, Ecosystems & Environment	4
Climate Change Mitigation and Agriculture	3
GCB Bioenergy	3
Journal of Environmental Management	3
Journal of Integrative Agriculture	3
Natural hazards	3
Nature	3
Science of The Total Environment	3
Other journals	31

Types of study	
Climate change	38
Crop growth/production	30
Conservation practices	23
Model development/Integration	18
Cropland Hydrology/water availability	17
Water quality	16
Review	16
Bioenergy	15
Optimization/SA/DS	14
Phosphorus transport	11
Soil erosion	11
Soil organic carbon	11
Crop Insurance/Economical Analysis	10
Nitrogen fate/transport	10
GHG	7
Other topics	43

User manual

- APEX/EPIC user manual is now available in multiple languages
  - English (updated 2017)
  - Spanish (2017)
  - Korean (2015)
  - Persian (2017)
  - Chinese version is on the way



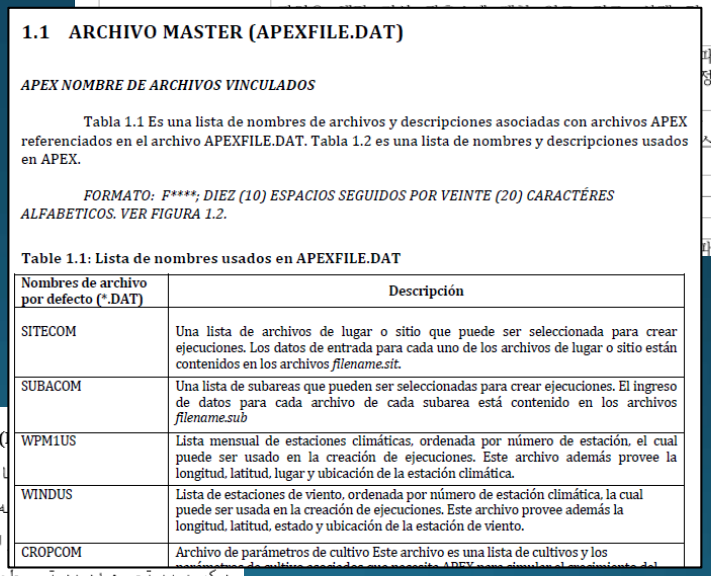
1.1 Master File (APEXFILE.DAT)

APEX FILE NAME LINKS

표 1.1은 APEXFILE.DATA 파일 내 언급된 APEX 구동과 관련된 파일명과 각 파일에 대한 설명을 나타낸다. 표 1.2는 APEX 파일 이름과 설명을 나타낸다.

[표 1.1]: APEXFILE.DAT에 표시된 파일리스트 리스트

초기 파일명(*.DAT)	내 용
SITECOM	모델 구동을 위해 선택한 장소파일의 리스트. 각각의 장소 파일에 대한 입력 데이터는 *filename.sit* 파일에 포함
SUBACOM	모델 구동을 위해 선택한 하위영역의 리스트. 각각의 하위영역 파일에 대한 입력 데이터는 *filename.sub* 파일에 포함
WPM1US	월별 기상관측소 리스트로 번호순으로 정렬되어 있음. 이



1.1 ARCHIVO MASTER (APEXFILE.DAT)

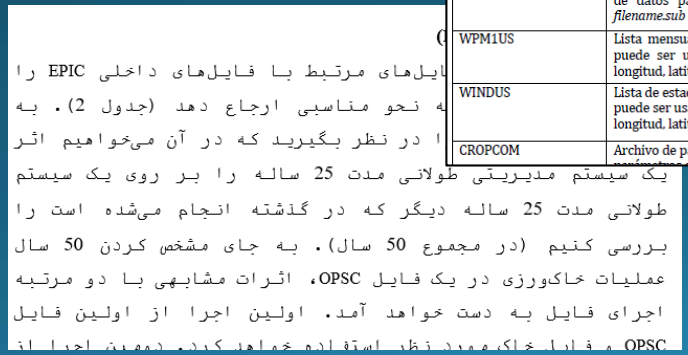
APEX NOMBRE DE ARCHIVOS VINCULADOS

Tabla 1.1 Es una lista de nombres de archivos y descripciones asociadas con archivos APEX referenciados en el archivo APEXFILE.DAT. Tabla 1.2 es una lista de nombres y descripciones usados en APEX.

*FORMATO: F****; DIEZ (10) ESPACIOS SEGUIDOS POR VEINTE (20) CARACTÉRES ALFABETICOS. VER FIGURA 1.2.*

Table 1.1: Lista de nombres usados en APEXFILE.DAT

Nombres de archivo por defecto (*.DAT)	Descripción
SITECOM	Una lista de archivos de lugar o sitio que puede ser seleccionada para crear ejecuciones. Los datos de entrada para cada uno de los archivos de lugar o sitio están contenidos en los archivos *filename.sit*.
SUBACOM	Una lista de subareas que pueden ser seleccionadas para crear ejecuciones. El ingreso de datos para cada archivo de cada subarea está contenido en los archivos *filename.sub*
WPM1US	Lista mensual de estaciones climáticas, ordenada por número de estación, el cual puede ser usado en la creación de ejecuciones. Este archivo además provee la longitud, latitud, lugar y ubicación de la estación climática.
WINDUS	Lista de estaciones de viento, ordenada por número de estación climática, la cual puede ser usada en la creación de ejecuciones. Este archivo provee además la longitud, latitud, estado y ubicación de la estación de viento.
CROPCOM	Archivo de parámetros de cultivo Este archivo es una lista de cultivos y los



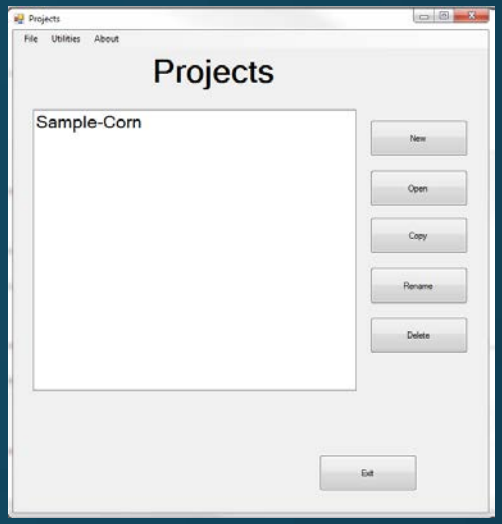
یک سیستم مدیریتی طولانی مدت 25 ساله را بر روی یک سیستم
طولانی مدت 25 ساله دیگر که در گذشته انجام می‌شده است را
بررسی کنیم (در مجموع 50 سال). به جای مشخص کردن 50 سال
عملیات خاک‌ورزی در یک فایل OPSC، اثرات مشابهی با دو مرتبه
اجرای فایل به دست خواهد آمد. اولین اجرا از اولین فایل

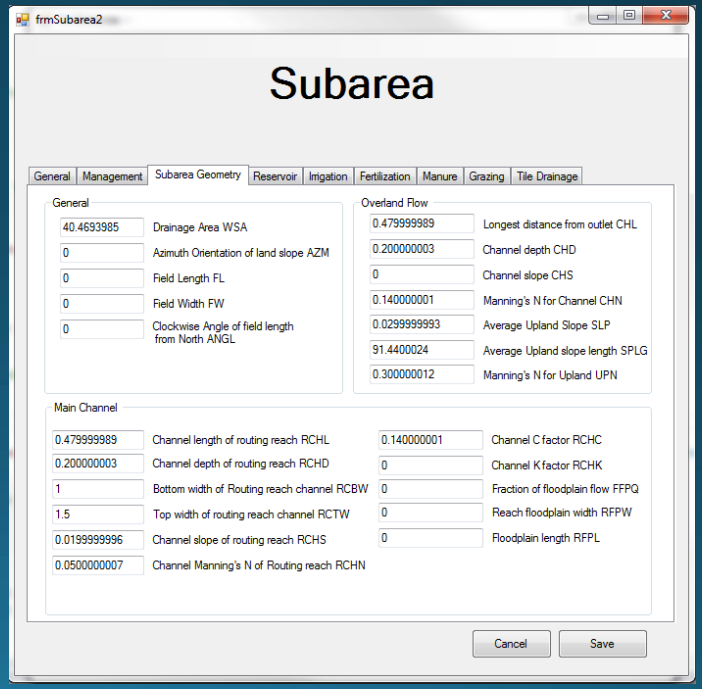
Training workshops

- Upcoming workshops
  - July 17-21, 2017, Sardinia, Italy
  - November, 2017, Universidade Federal de Mato Grosso, Brazil
  - January, 2018, India
- Past workshops (20+)
  - Quito, Ecuador – May 1-5, 2017
  - Temple, TX – April 18-20, 2017
  - Dar es Salaam, Tanzania – January 23-27, 2017
  - Jeonju, South Korea – October 5-7, 2016
  - Temple, TX – September 7-9, 2016
  - Changsha, China – August 2-3, 2016
  - Lincoln, NE – April 12-14, 2016
  - Temple, TX – January 26-28, 2016
  - Accra, Ghana – February 1-5, 2016
  - Addis Ababa, Ethiopia – February 8-12, 2016
  - Purdue University, October 2015
  - Morogoro, Tanzania, July 2015
  - Sardinia, Italy, June 2015
  - Beltsville, MD, May 2015
  - Bahir Dar, Ethiopia, February 2015
  - Quito, Ecuador, 2013
  - Addis Ababa, Ethiopia, 2013
  - …

Supporting Tools

- WinAPEX development for .NET framework (by 2017)
- ArcAPEX for APEX1501 now supports ArcGIS 10.3
- APEX-CUTE 4.3
  - Calibration
  - Sensitivity Analysis
- APEX-EDITOR
  - Edit input files





New WinAPEX Windows

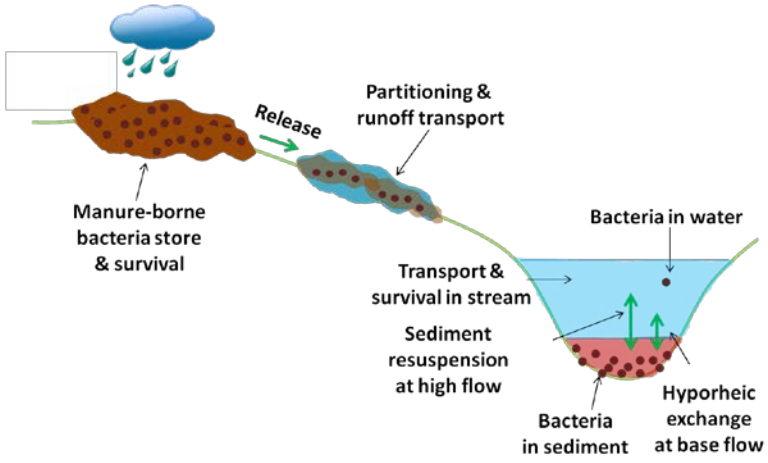
APEX/EPIC Developments

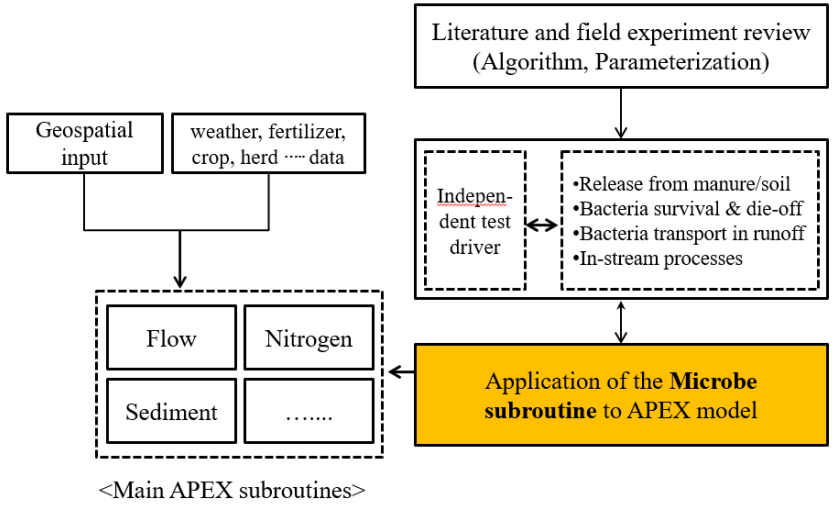
1. APEX Bacteria model
2. Preferential grazing
3. APEX Paddy model
4. Soil moisture simulation

1. APEX-Bacteria model

Hong et al. (submitted)

Microbial fate and transport module

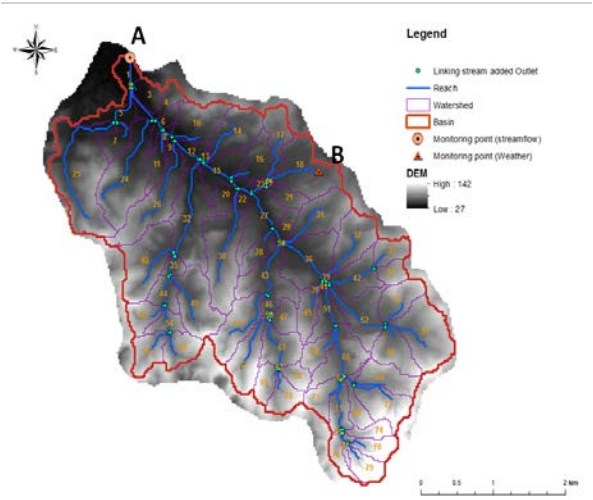




Slide contributed by Eunmi Hong, USDA-ARS, Beltsville, MD

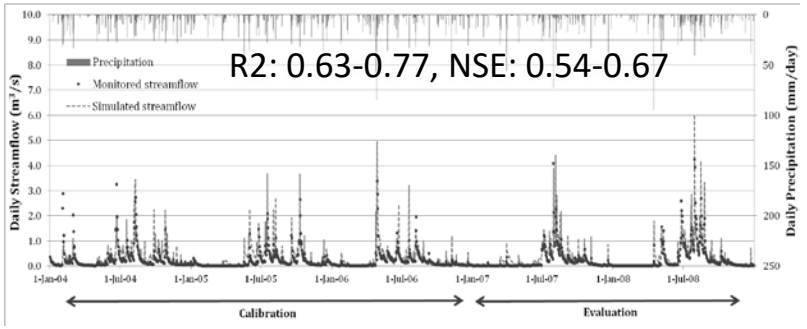
1. APEX-Bacteria model

Tonepi watershed Study

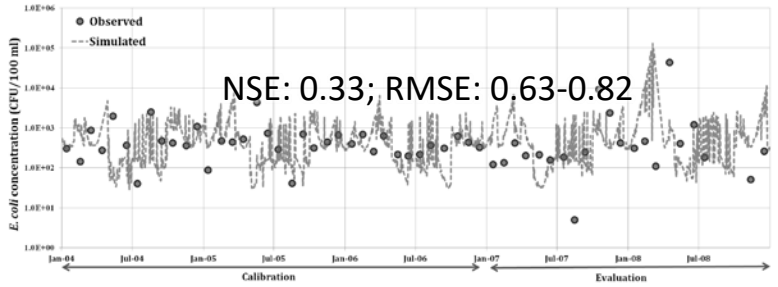


Area: 1,538 ha
Rainfall: 1,306 mm
Landuse: pasture with intensive grazing all year round

Streamflow



E. Coli concentration

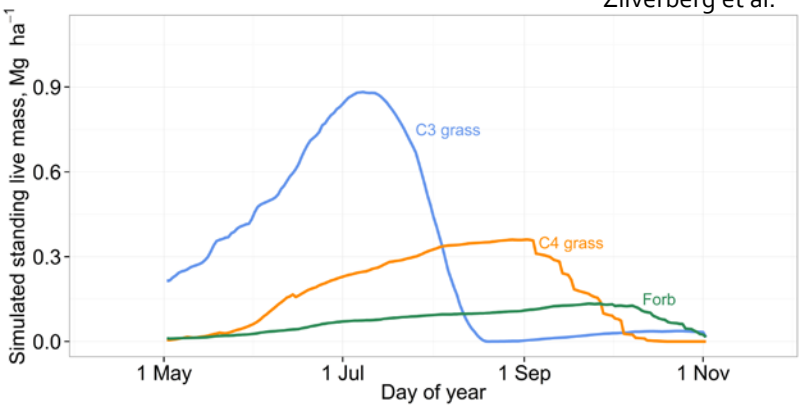


Slide contributed by Eunmi Hong, USDA-ARS, Beltsville, MD

2. APEX preferential grazing

- **PHY**tomass **GROW**th Model
- Characterizes complex grazing systems and herbivories
- Preferential grazing between different plants
- Multiple herds in a subarea to graze
- This version is available in APEX 1605

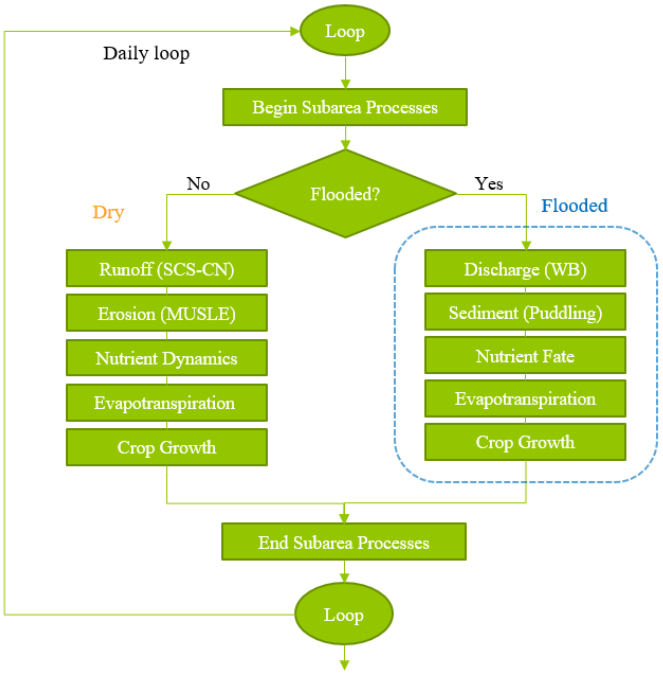
Zilverberg et al.



- Standing live mass was predominantly C3 grass from May until ~1 Aug.
- C3 mass peaked in early July
- C3 grass had a small increase in mass in autumn
- C4 peaked ~ 1 Sept.

3. APEX-paddy model

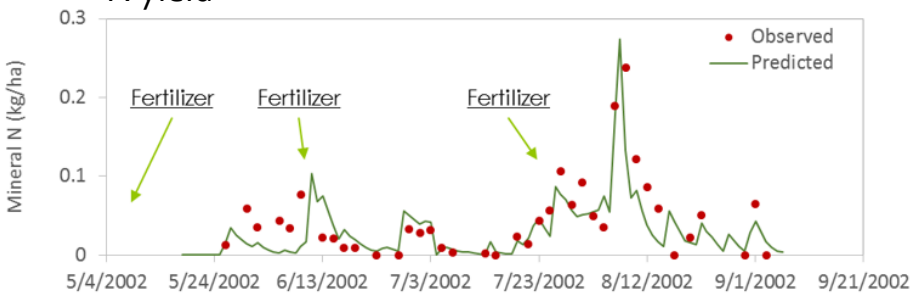
Choi et al. (submitted)



APEX-Paddy Algorithm

Discharge

N yield



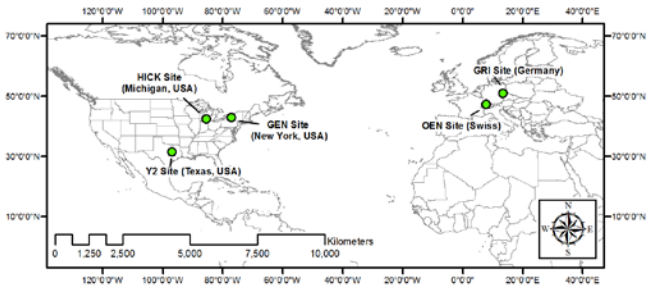
4.Dynamic soil moisture simulation

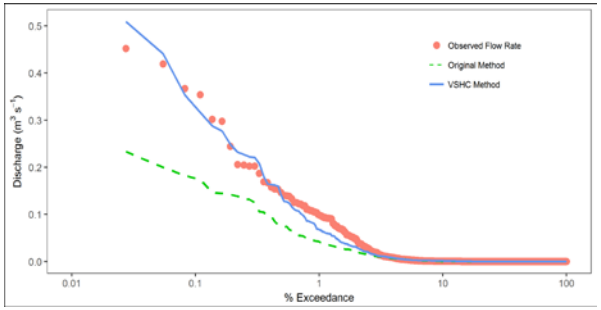
Doro et al. (submitted)

$$K_{eff} = HC \times \left[\frac{ST - FC}{PO - FC}\right]^{\varepsilon}$$

Daily soil moisture content at the OEN site

Study sites





High flows improved significantly in the Y2 watershed

Future plan (5 yrs)

- Soil temperature
- Soil chemistry (reactive transport of metal ions)
- APEX-MODFLOW
- Lateral overland flow routing
- AERO wind erosion
- Southern Oscillation Index for WXGEN
- QGIS Integration
- Pest dynamics & pesticide modules

Summary

- EPIC and APEX modeling community is growing
- Most applications are on climate change effects, food production, and conservation practices
- Spatial scale varies from field scale to continental scale with model integrations and the incorporation of GIS
- New subroutines are continuing to be developed for simulating new processes, managements, and systems
- Model developers at Texas A&M are committed to support the growing APEX/EPIC model community