GIS 환경시스템 연구실

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Development of Web-based SWAT LUC with SWAT BFlow Alpha Factor Module

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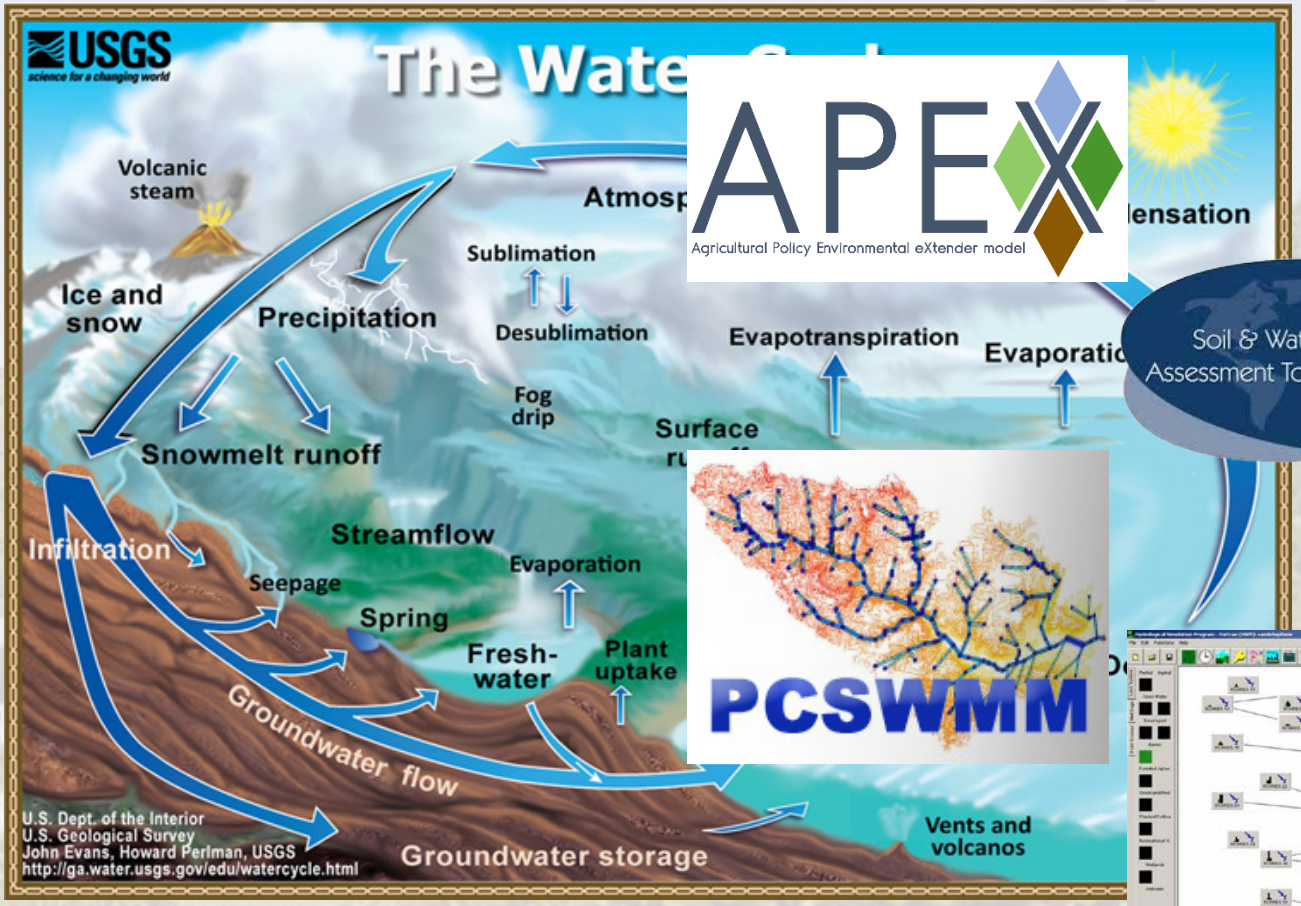
PART 1 Introduction

❖ Hydrology Cycle & Model



- ✓ Most hydrological models can not deal with land use dynamics

Does hydrological models simulate correctly without considering landuse change?

SWAT Input Data

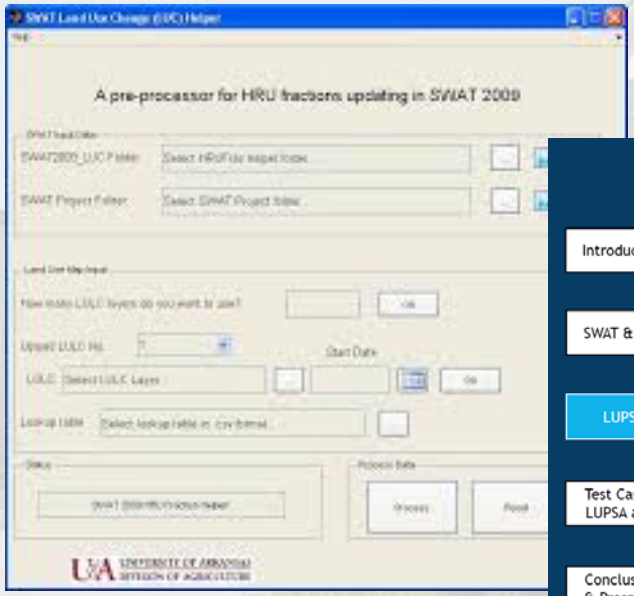
Input Type	Static	Dynamic
		Climate
SWAT Input		**Land Use**
	Soil	
	Terrain	
Scale	Geological / Centuries / Decades	**Years** / Days / Hours

(Friedrich J. Koch, 2012)

✓ SWAT Model cannot consider dynamic land use change

- ✓ SWAT2009_LUC, SWAT LUSPA, SWAT Tool have been developed to overcome this problem in Soil and Water Assessment Tool(SWAT).

SWAT 2009_LUC



Introduction

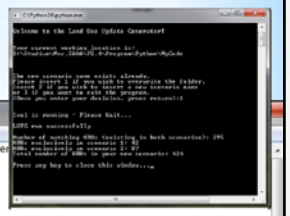
SWAT & LUC

LUPSA

Test Case & LUPSA app.

Conclusions & Prospects

Program Language: Python
License: Open Source
OS: Windows (95+) and Linux
Running on: Command Line
GUI: .txt setup file



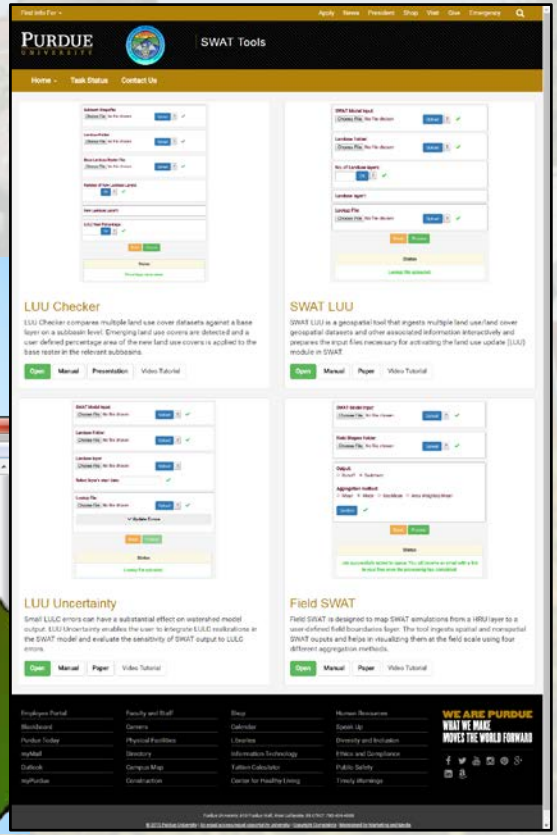
Related modified SWAT Version

SWAT2009lu-slope.exe

SWAT2009lu-noslope.exe

SWAT2009lu-slope-slopelength.exe Fraction + slope + slope length updated

SWATLUPSA for Land Use Change



- ✓ The SWAT2009_LUC and SWAT Tool cover only existing HRUs in SWAT scenarios.
- ✓ The SWAT LUPSA module can account unique HRUs and update HRU slopes.

HRU:
Fraction: 0.13
Slope: 22%

HRU_1:
Fraction: 0.06
Slope: 18%
HRU_2:
Fraction: 0.07
Slope: 25%

(Friedrich J. Koch, 2012)

- ✓ The SWAT LUPSA module is not publicly accessible at this time.

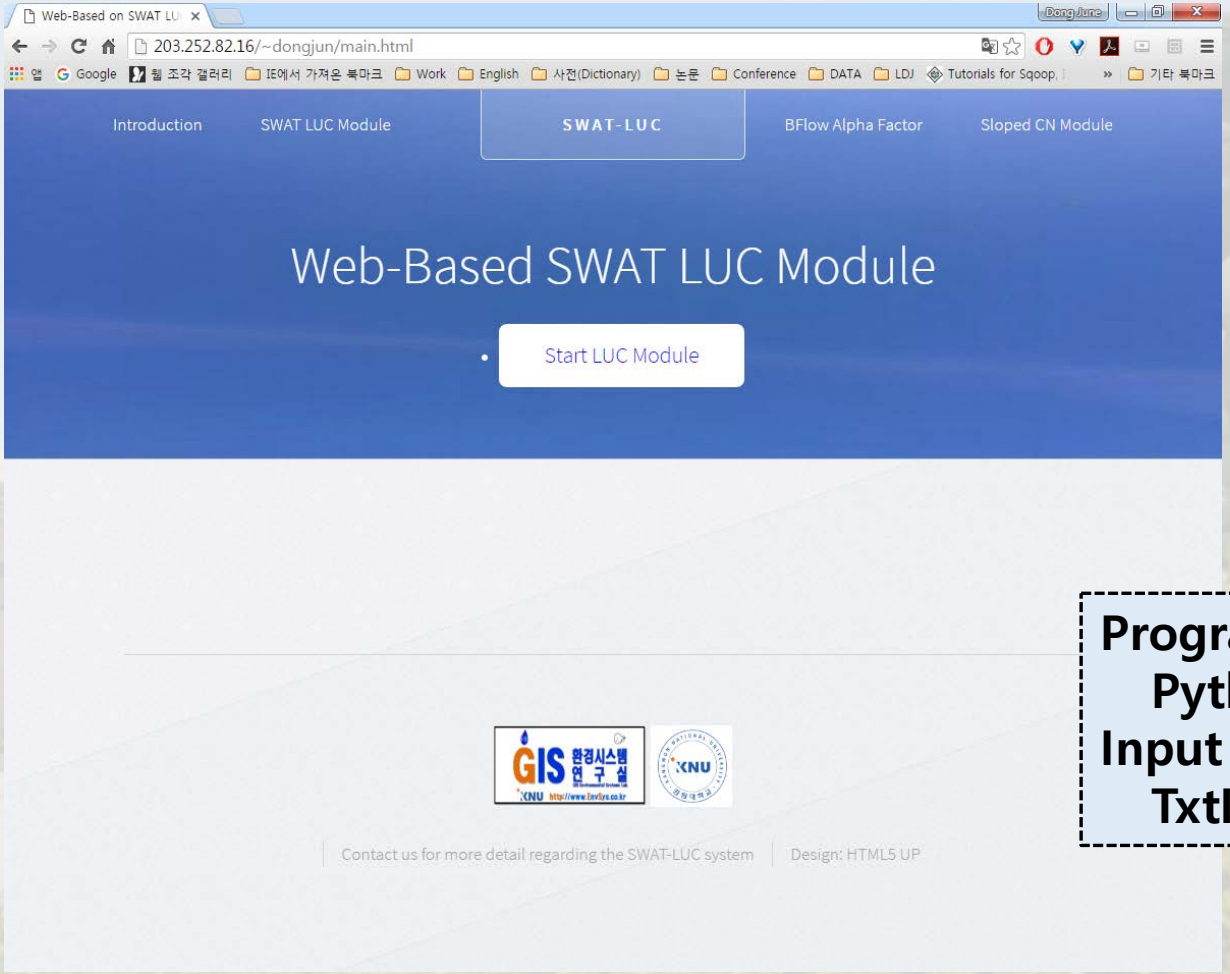
01 Introduction

- ✓ In the study, the Web-based interface were developed to provide user-friendly interface for dynamic SWAT modeling considering spatial and temporal characteristics at a watershed.
- ✓ Web-based SWAT LUC was developed base on LUPSA module.
- ✓ Development of SWAT BFlow function to apply alpha factors.
- ✓ Additional functionality can help SWAT users to simulate more correctly.

PART 2

Design & Functions

❖ Web based SWAT LUC



Program Language:
Python, HTML
Input Data:
TxtInOut.zip file

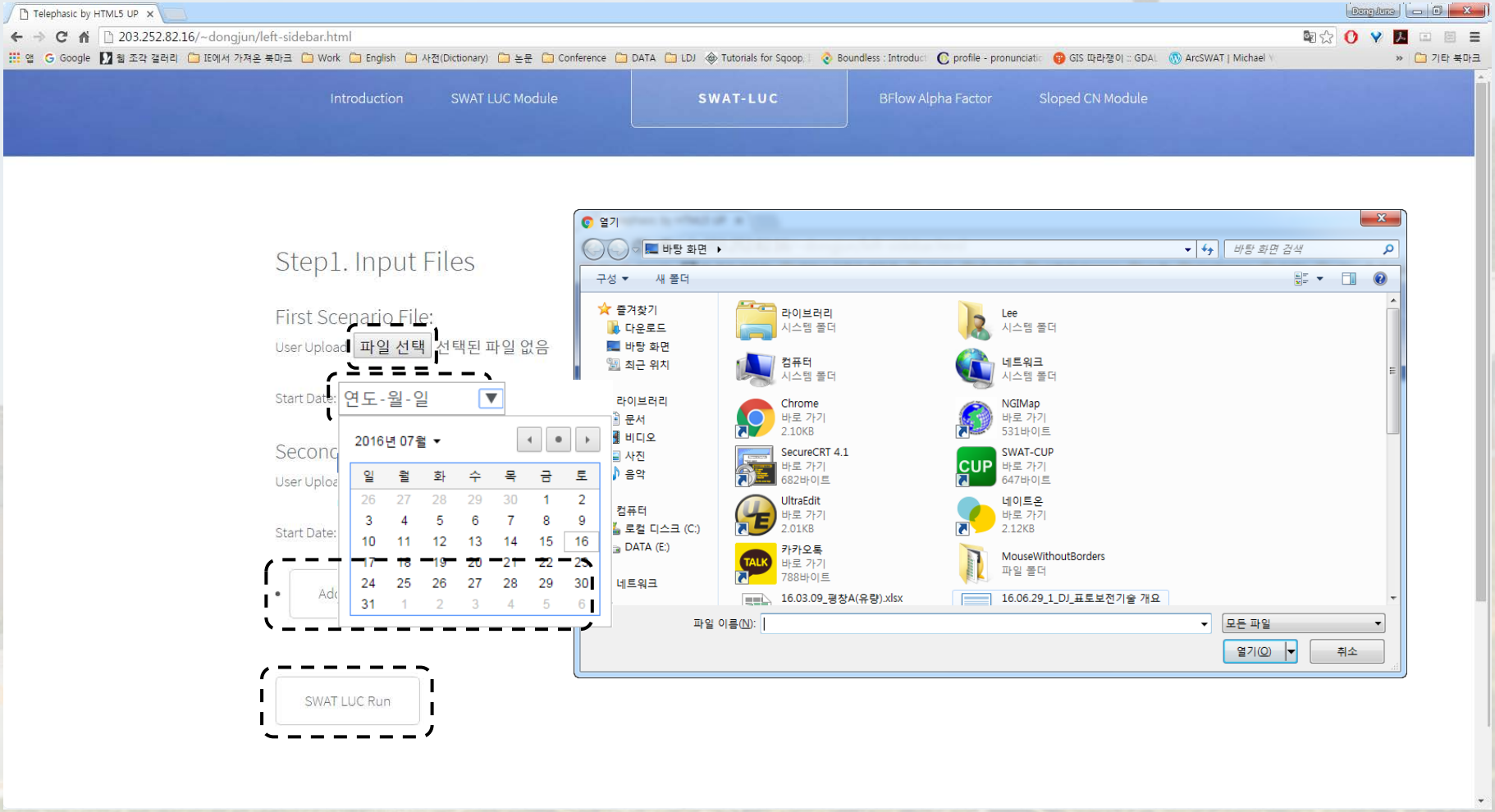
❖ Web based LUC Module process

For one subbasin (Friedrich J. Koch, 2012)

Result	Scenario 1			Scenario 2			New HRU
	HRU	Fraction	Slope	HRU	Fraction	Slope	
Match	000010001	Frc1	Slp1	000010001	Frc2	Slp2	000010001
Unique in 1	000010002	Frc1	Slp1	-	-	-	000010002
Match	000010003	Frc1	Slp1	000010002	Frc2	Slp2	000010003
…	…	…	…	…	…	…	…
Unique in 2	-	-	-	000010015	Frc2	Slp2	000010019
Unique in 2	-	-	-	000010016	Frc2	Slp2	000010020

1. Extract identification, area, and slope of HRUs, rename, rewrite new HRUs
2. Update 'Lup.dat', 'file1.dat'… 'file(n).dat', 'file.cio' files.
3. Check total sub-catchment HRU fractions

❖ Web based SWAT LUC



Design & Functions

❖ E

[Option 1] Enter your flow data here !	[Option 2] Upload dat file!

Enter WQ Data for LDC

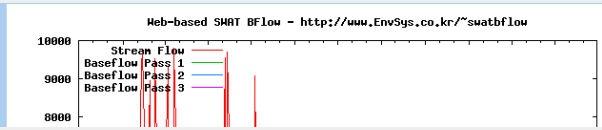
www.envsys.co.kr/~swatbflow/USGS_GOOGLE/run_SWAT_BFLOW_using_usgs_flowdata.cgi

1: GoogleMap Interface (48 states in US Only) | 2: Enter / Upload my date/flow data | 3: Related Doc

SWAT BFlow was run successfully [1940 ~ 1940]

Baseflow Ratio	First Pass	Second Pass	Third Pass	Alpha Factor
baseflow/streamflow	0.58	0.41	0.31	0.2428 <<== Use this in SWAT .gw file ::: Alpha value editor program ::: http://www.envsys.co.kr/~swatbflow/USGS_GOOGL

Download SWAT BFlow Output --- or Open Output in HTML Table

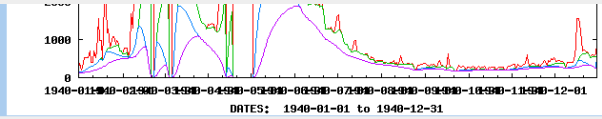


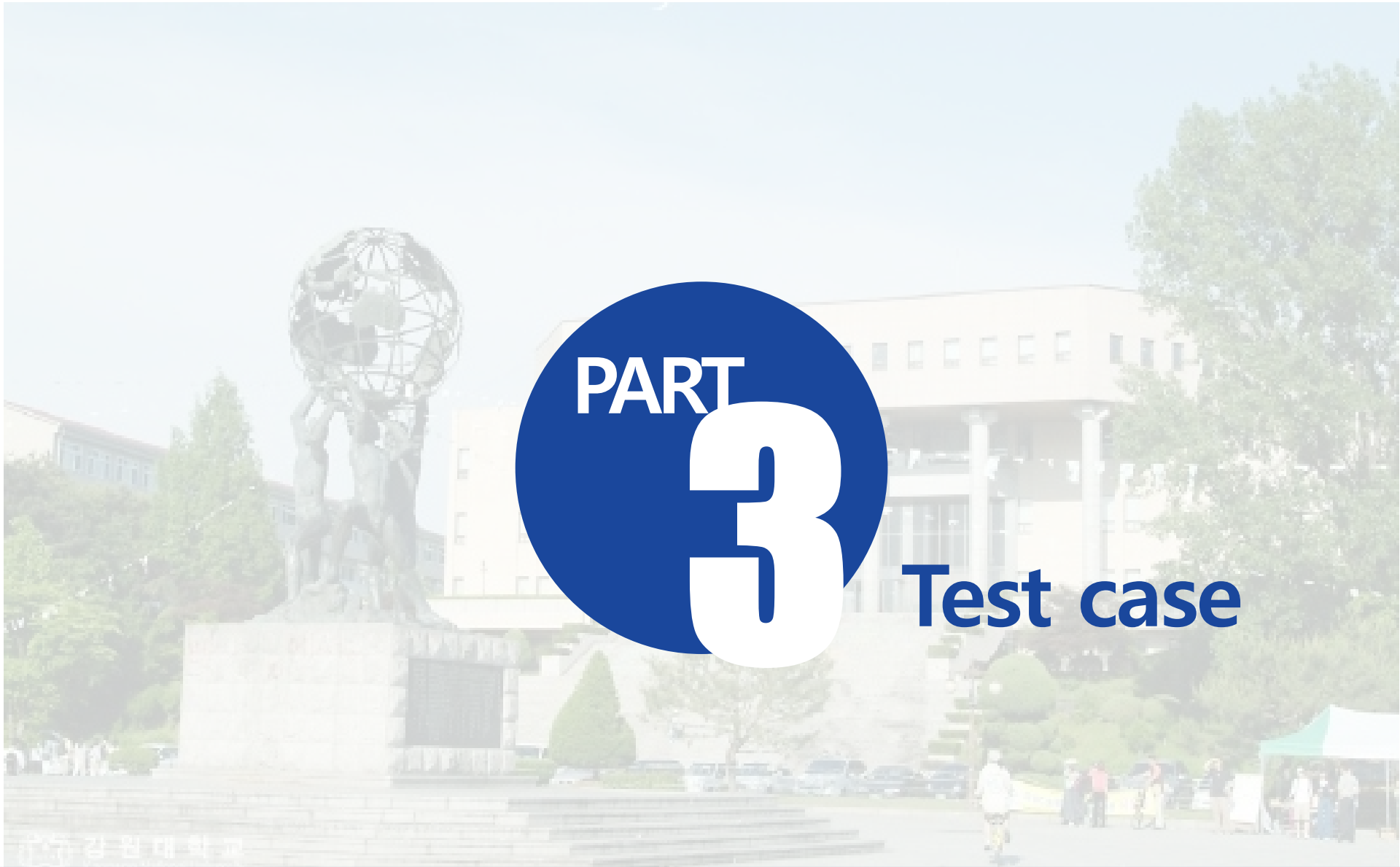
Alpha Factor

0.2428 <<== Use this in SWAT .gw file

::: Alpha value editor program :::

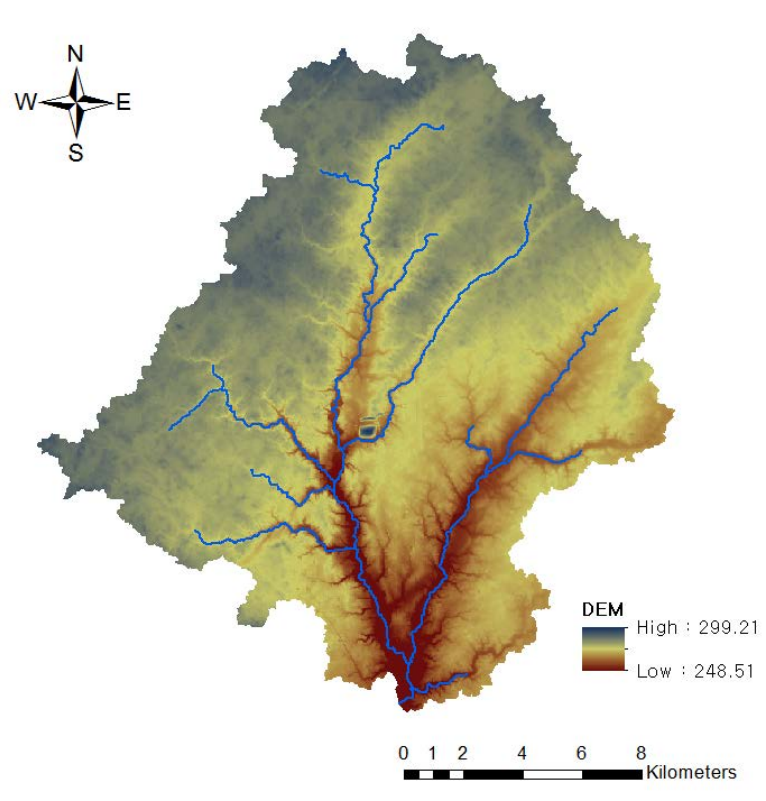
http://www.envsys.co.kr/~swatbflow/USGS_GOOGL





PART 3 Test case

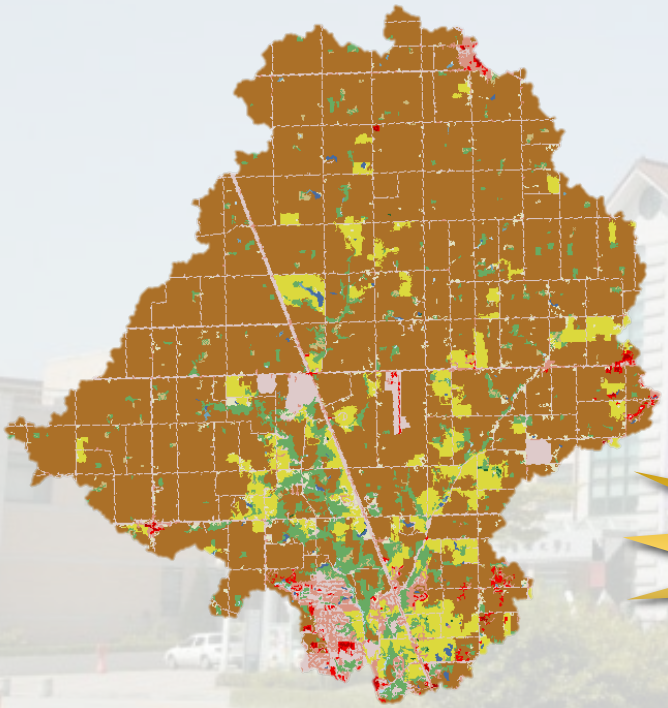
❖ Little Eagle Creek Ave, IN



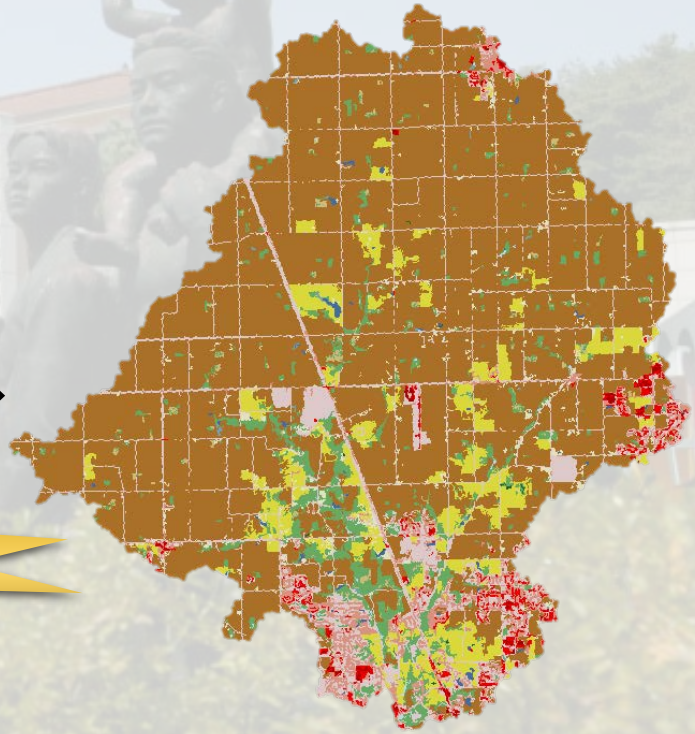
- Area: ~258.20 km^2
- Elevation: 257.02 ~ 289.91 m
- Slope: 0.88 ~ 4.40 %

- Using Landsue data:
  - Landuse data of 2001
  - Landuse data of 2011

❖ Little Eagle Creek Ave, IN



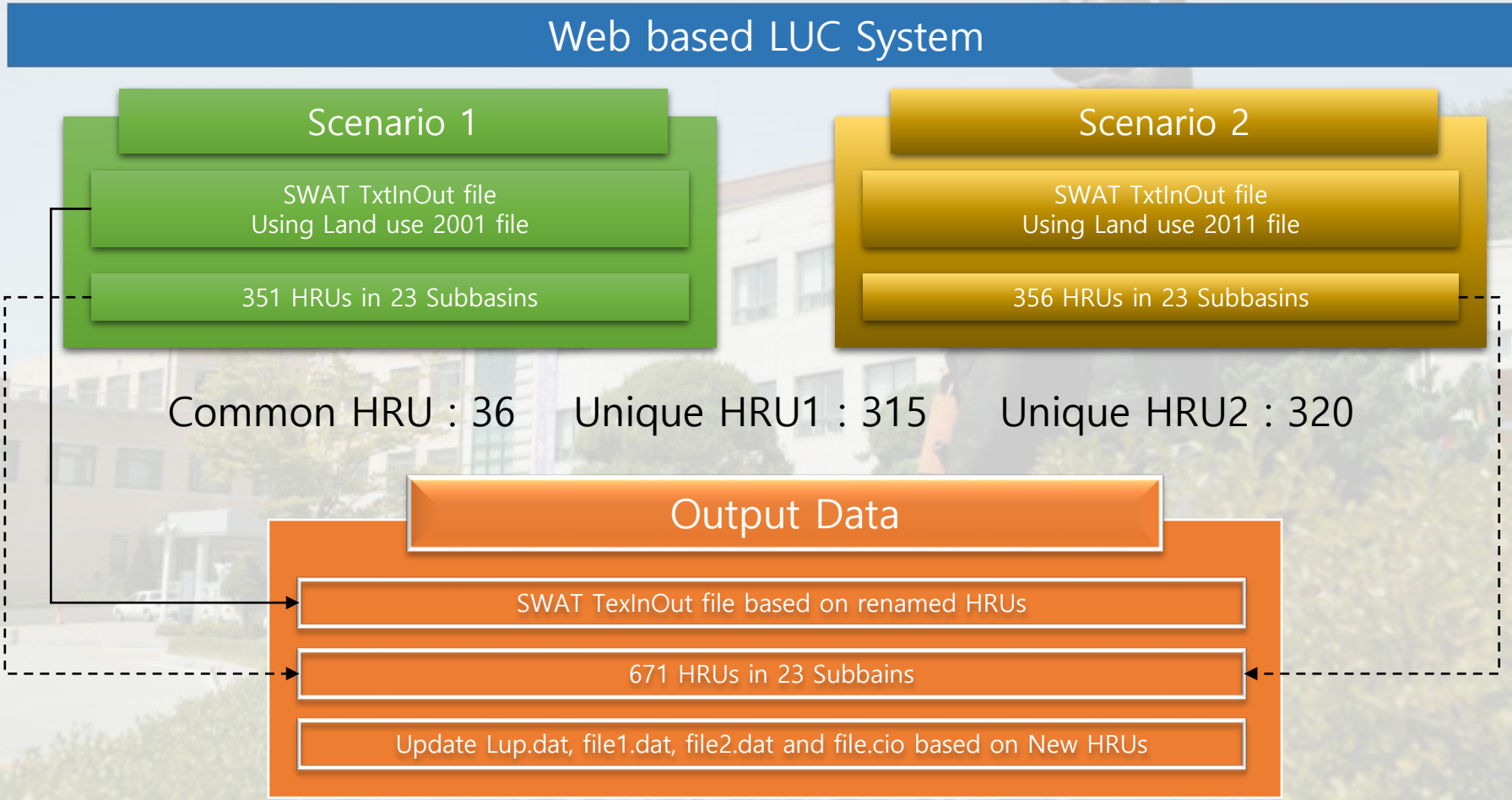
Urbanization



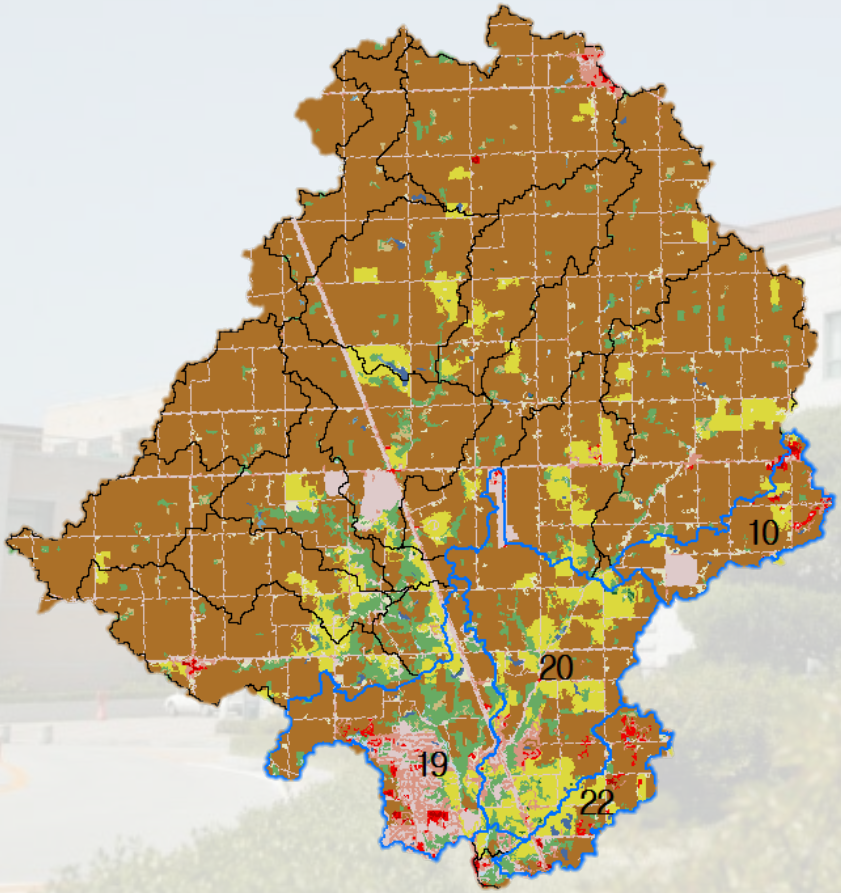
2001

2011

❖ Web based LUC Process of Test case



❖ Compare Flow Simulation



(m^3/s)

Subbasin		Mean	Max	Min
10	2001	0.151	3.736	0.000
	2011	0.151	3.850	0.000
	LUC	0.157	3.572	0.001
19	2001	3.087	71.44	0.000
	2011	3.087	71.51	0.000
	LUC	3.224	64.98	0.000
20	2001	1.318	31.74	0.000
	2011	1.318	32.09	0.000
	LUC	1.369	28.97	0.002
22	2001	0.125	3.115	0.000
	2011	0.124	3.167	0.001
	LUC	0.132	3.150	0.001
Final outlet	2001	4.546	106.70	0.000
	2011	4.545	107.10	0.000
	LUC	4.745	97.59	0.000

PART 4

Conclusions & Prospects

04 Conclusions & Prospects

❖ Prospects

- ✓ Development and application of BMPs Module
- ✓ Development and application of the Sloped CN module
- ✓ Correct error in the Web-based LUC site
- ✓ Open the web-site at the end of the year

❖ Conclusions

- ✓ The system, developed in this study, can consider dynamics of watershed spatially and temporarily with better accuracies than ever before.
- ✓ This system will be helpful in deciding policy related to land use change.

Thank you for your attention!