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TERRECO
Complex TERRain and ECOlogical Heterogeneity
International Research Training Group
DFG / KOSEF

Analysis of effects on validation of spatiotemporal changes in cropping at agriculture-dominant watershed

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2011 SWAT

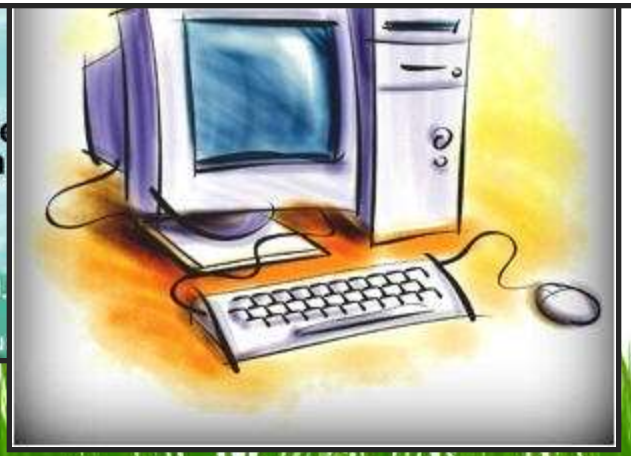
What is the Hydrologic models ?

Hydrological modelling

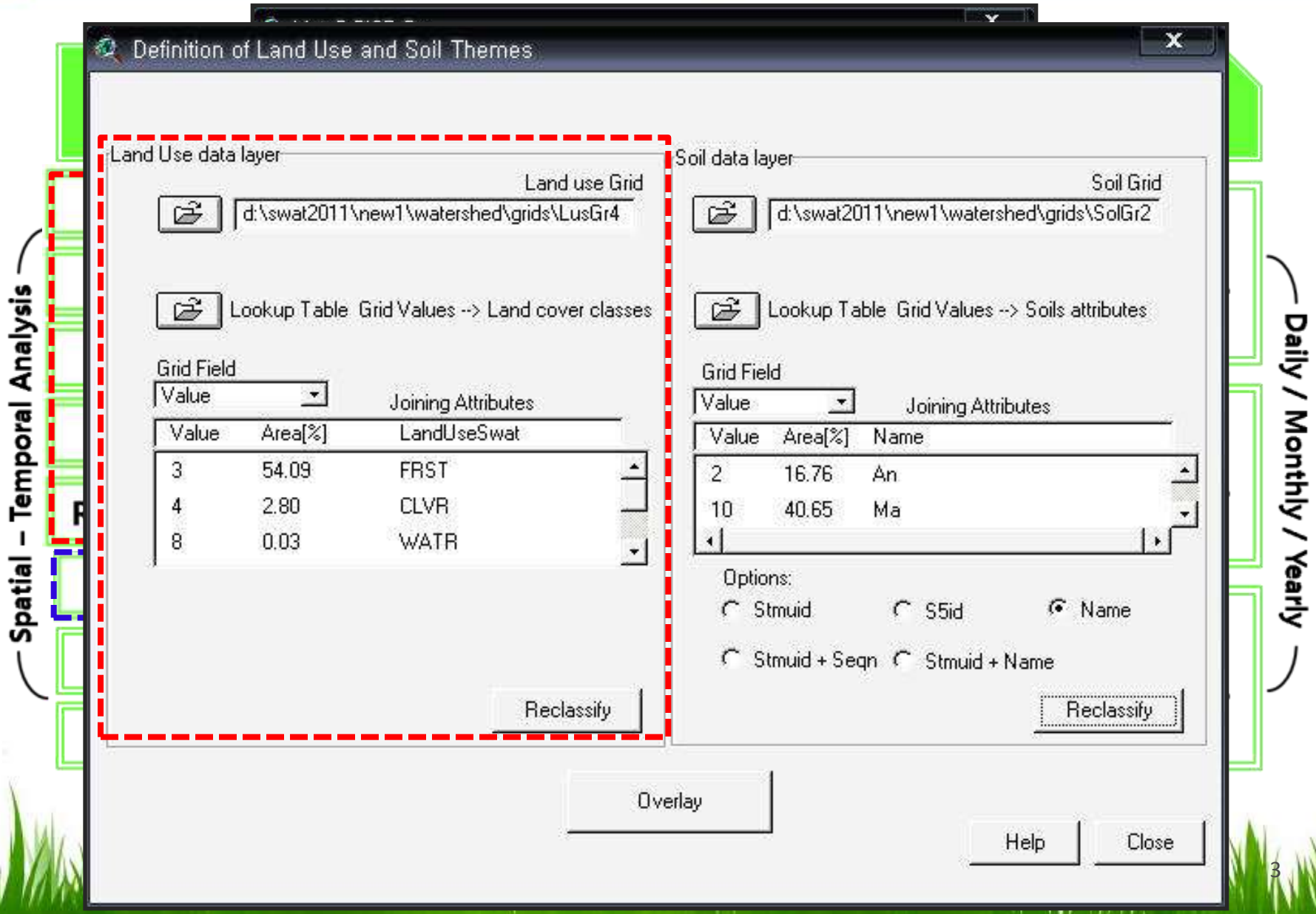
From Wikipedia, the free encyclopedia

Hydrologic models are simplified, conceptual representations of a part of the hydrologic cycle. They are primarily used for hydrologic prediction and for understanding hydrologic processes. Two major types of hydrologic models can be distinguished:

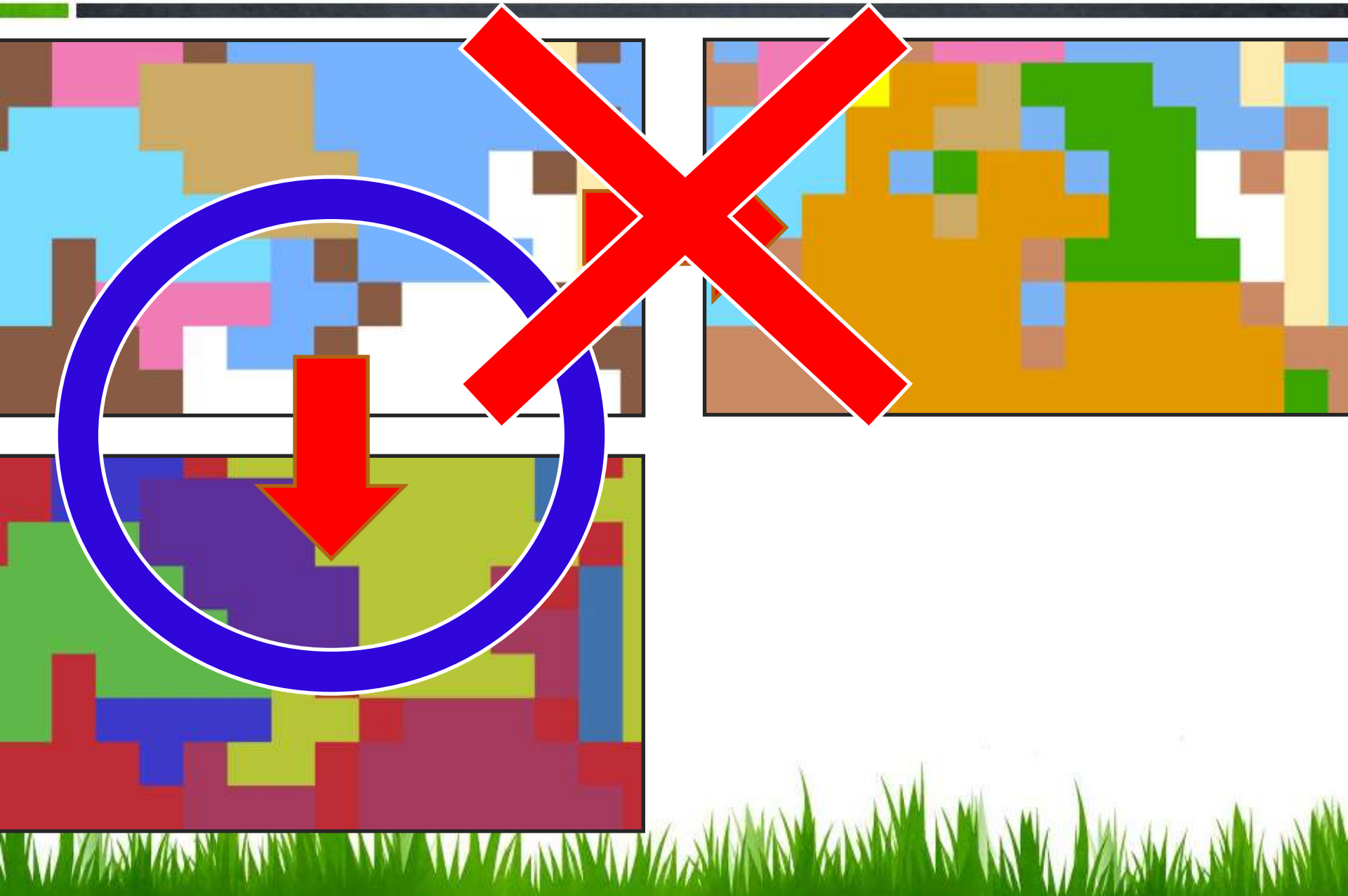
- Stochastic Models. These models are black box systems, based on data and using mathematical and statistical concepts to link a certain input (for instance rainfall) to the model output (for instance runoff). Commonly used techniques are regression, transfer functions, neural networks and system identification. These models are known as stochastic hydrology models.
- Process-Based Models. These models try to represent the physical processes observed in the real world. Typically, such models contain representations of surface runoff, subsurface flow, evapotranspiration, and channel flow, but they can be far more complicated. These models are known as deterministic hydrology models. Deterministic hydrology models can be subdivided into single-event models and continuous simulation models.



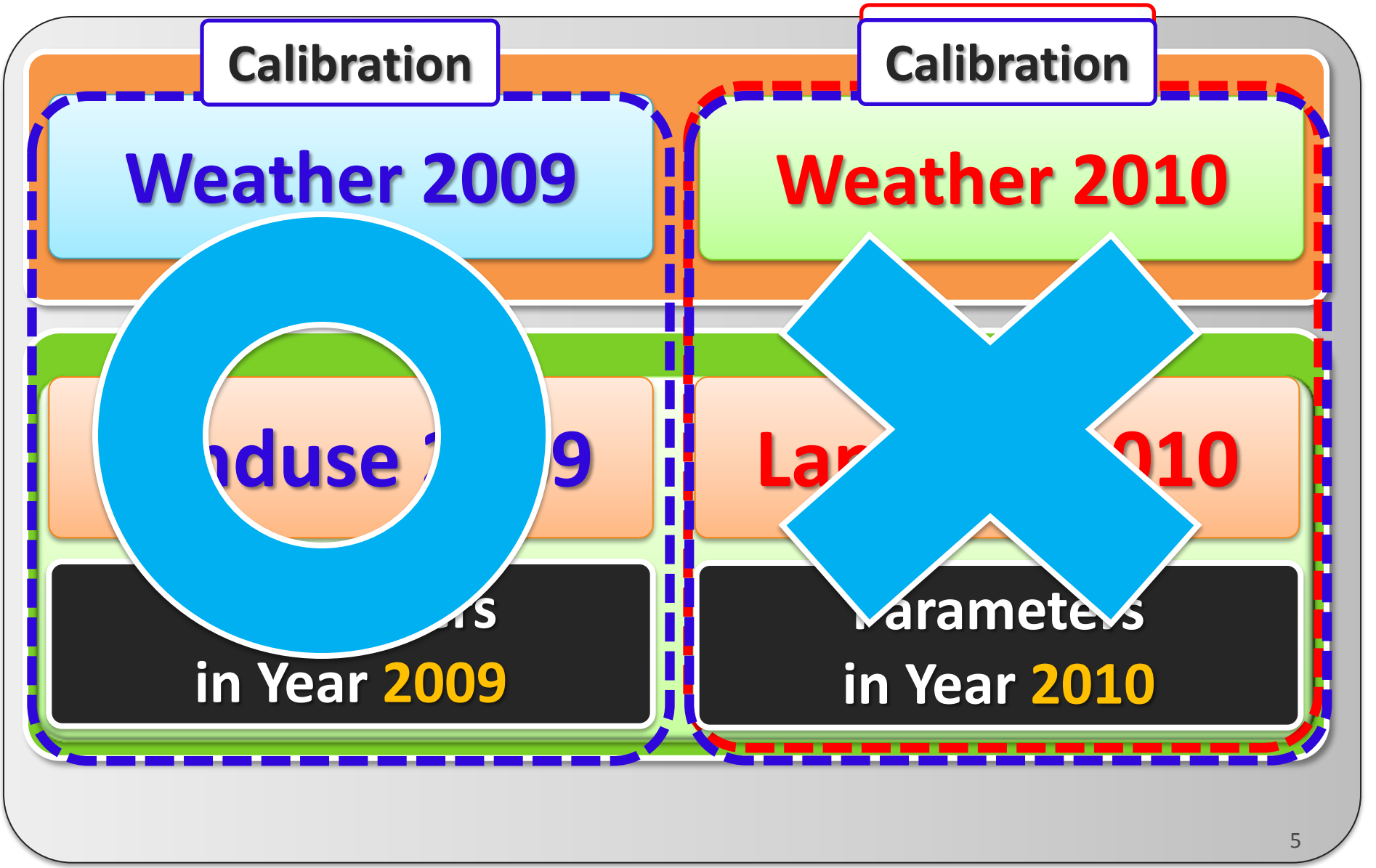
SWAT


Definition of Land Use and Soil Themes
Land Use data layer
Land use Grid
d:\swat2011\new1\watershed\grids\LusGr4
Lookup Table Grid Values --> Land cover classes
Grid Field
Value
Joining Attributes
Value Area[%] LandUseSwat
3 54.09 FRST
4 2.80 CLVR
8 0.03 WATR
Reclassify
Soil data layer
Soil Grid
d:\swat2011\new1\watershed\grids\SolGr2
Lookup Table Grid Values --> Soils attributes
Grid Field
Value
Joining Attributes
Value Area[%] Name
2 16.76 An
10 40.65 Ma
Options:
Stmuid
S5id
Name
Stmuid + Seqn
Stmuid + Name
Reclassify
Overlay
Help
Close
Spatial – Temporal Analysis
Daily / Monthly / Yearly

Limitation of SWAT model



The objectives of this study



Study Area

배추값 폭등...한 포기 13,800원

2010-09-28 05:49

배추 한 포기 소매가격이 만3,800원까지 오르며 사상 최고치를 기록했습니다.

농협 하나로클럽 양재점에 따르면 어제 배추 한 포기 시세는 만3,800원으로 추석 직전 가격인 9,800원에 비해 10여일 사이에 또다시 4,000원이나 오른 것으로 나타났습니다.

농협 관계자는 매장에서 배추를 사는 일반 소비자는 거의 없었다면서 추석 이후 개인 소비자들의 배추 수요는 줄었지만 김치 공장의 수요를 감당하지 못해 배추값이 치솟고 있다고 말했습니다.

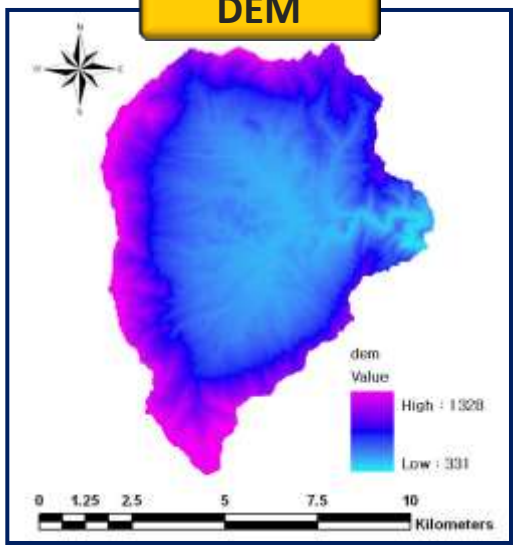
배추와 함께 기습폭우의 피해를 보았던 대파도 한 단에 6,150원으로, 추석 전 4,000원대에서 2,000원 가량 오른 상태입니다.

Soyanggang-dam Watershed, Kangwon

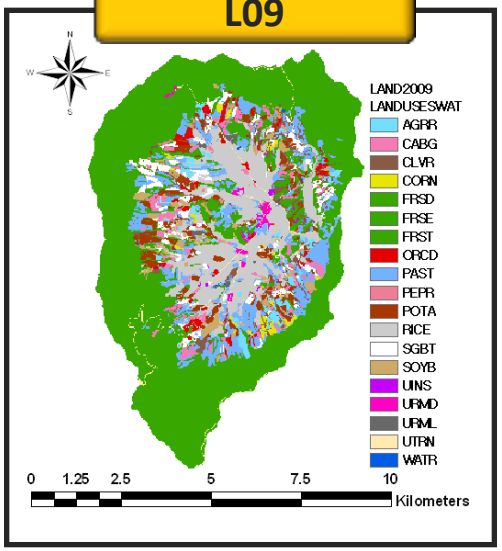
Mandae watershed

Input data of this study

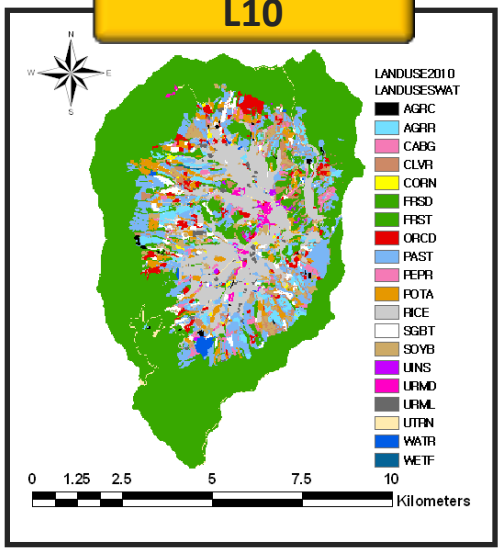
DEM



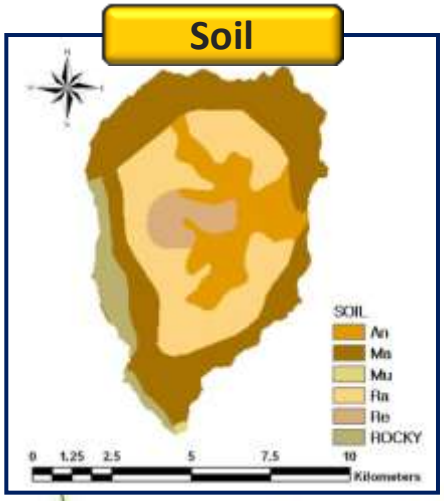
L09



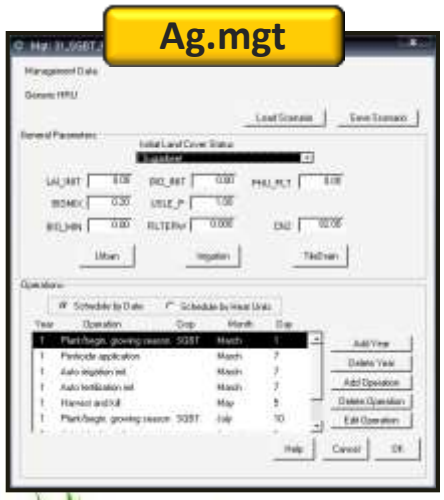
L10



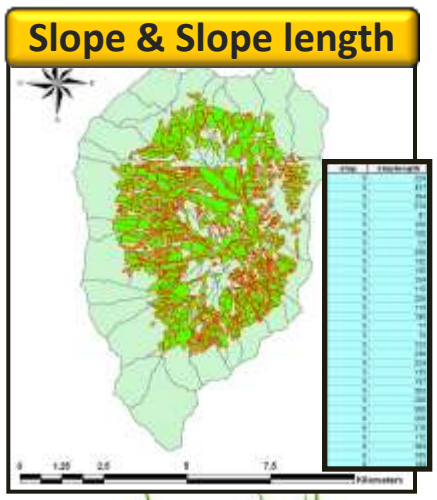
Soil



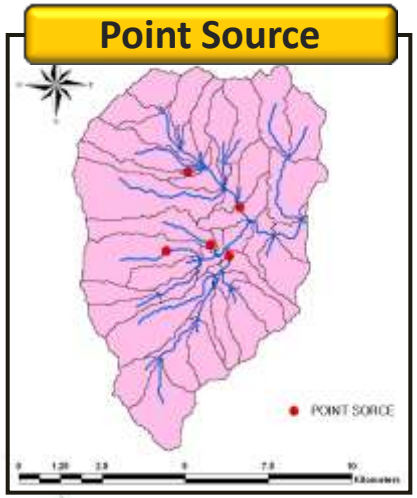
Ag.mgt



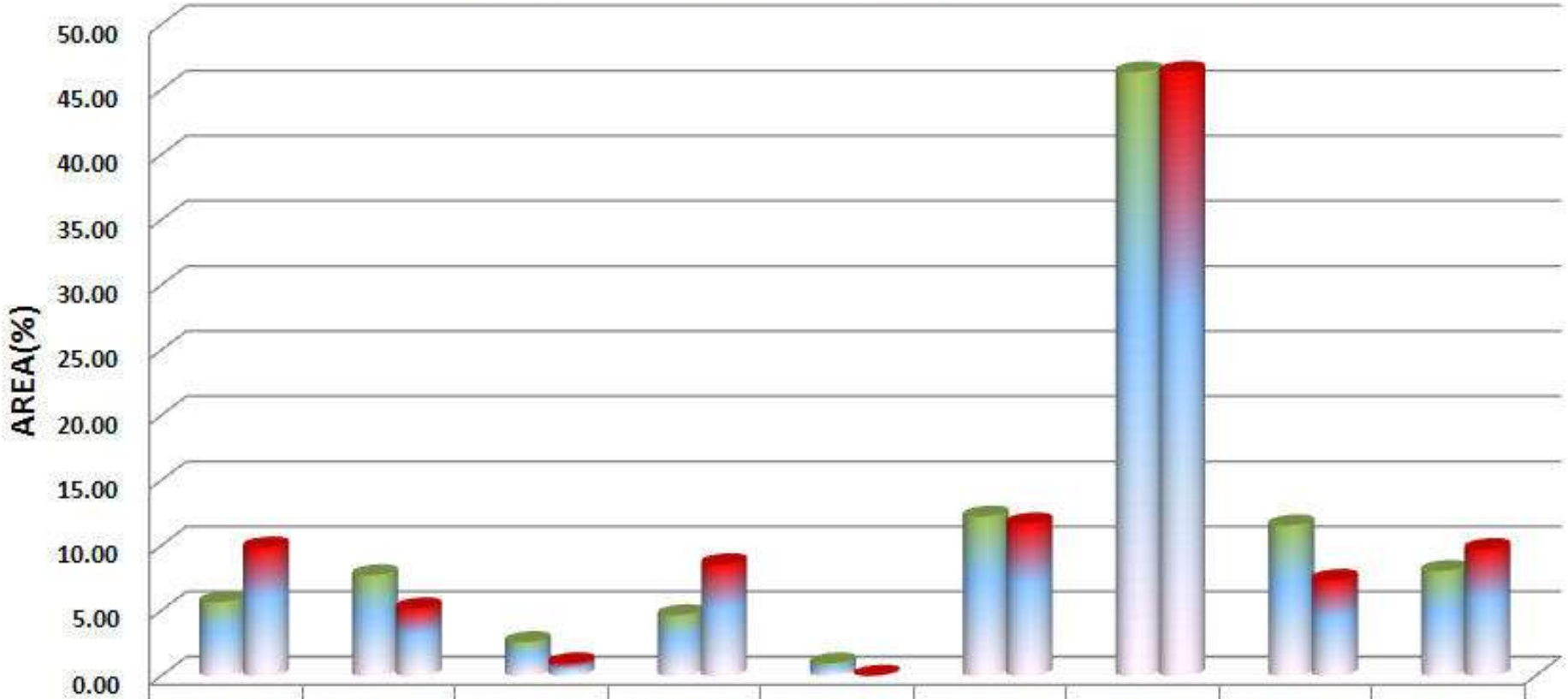
Slope & Slope length



Point Source

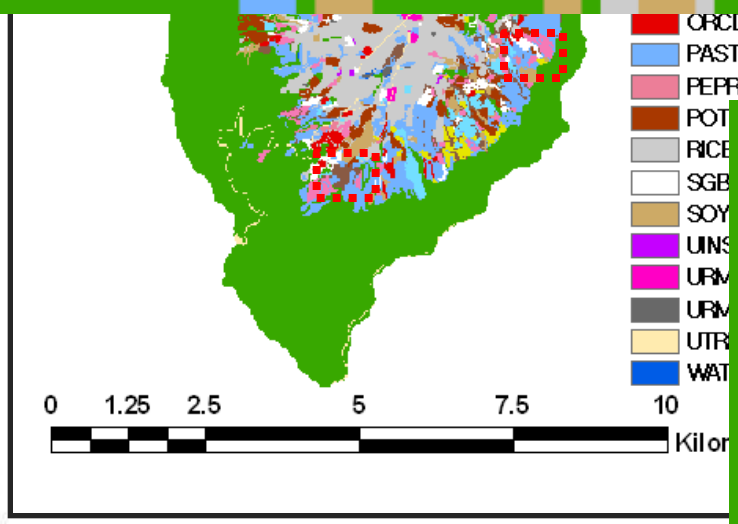


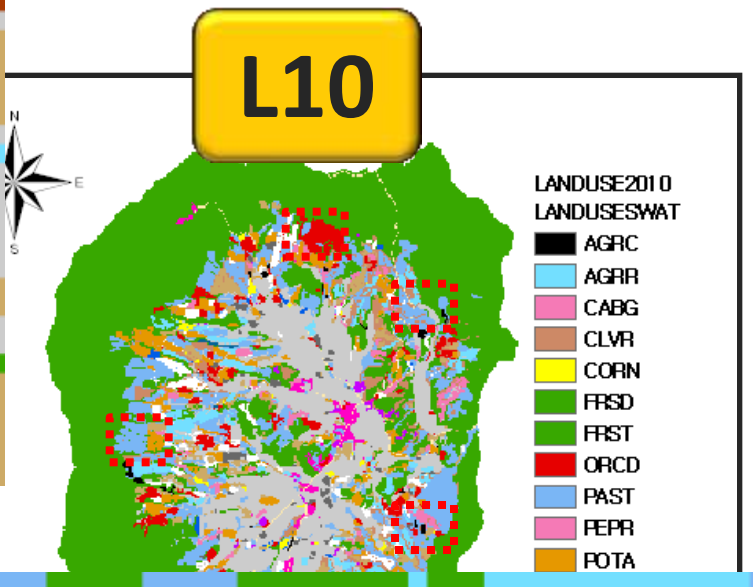
Comparison of landuse 2009/2010



	Pumpkin	Cabbage	Corn	Orchard	Pepper	Potato	Rice	Radish	Soybean
L09(%)	5.69	7.75	2.63	4.68	0.98	12.25	46.37	11.58	8.08
L10(%)	9.88	5.21	0.99	8.60	0.04	11.73	46.39	7.39	9.76

Spatial changes in cropping

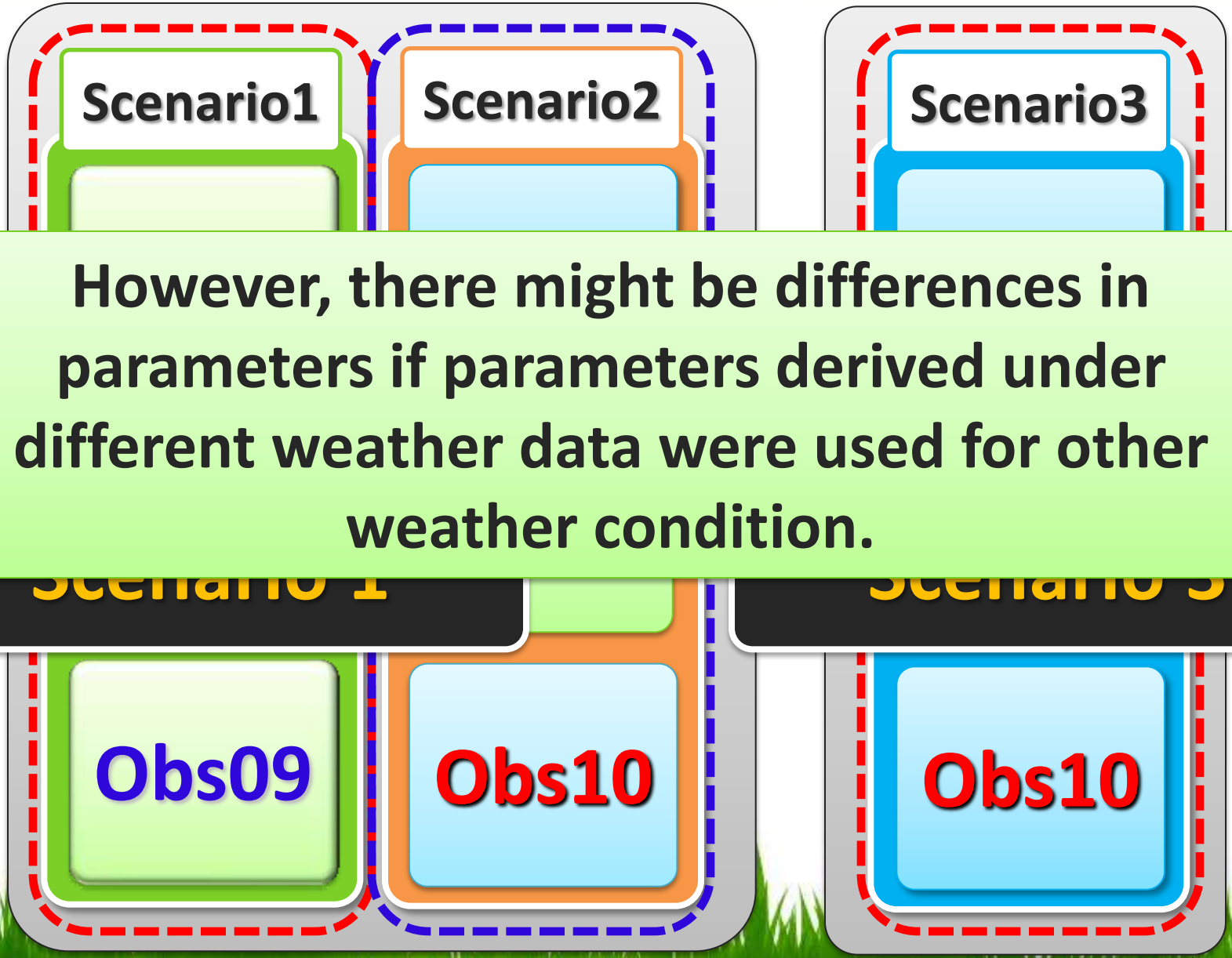




Please remember this Terms

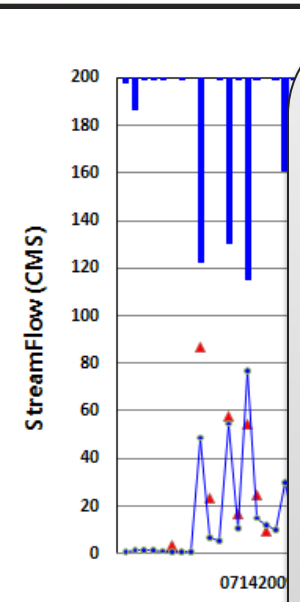
W09	Weather 2009	L09	Landuse 2009
W10	Weather 2010	L10	Landuse 2010
Obs09	Observed Data 2009, 2010		
Obs10			

Methodologies



However, there might be differences in parameters if parameters derived under different weather data were used for other weather condition.

Results of Scenario 1



Scenario1

W09

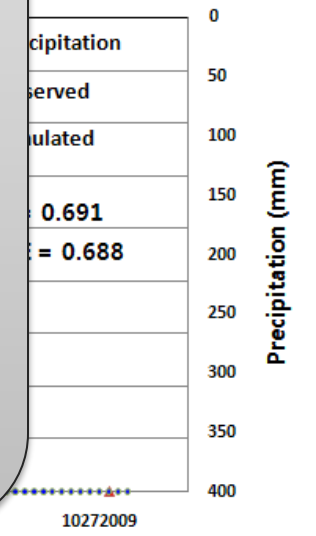
L09

Obs09

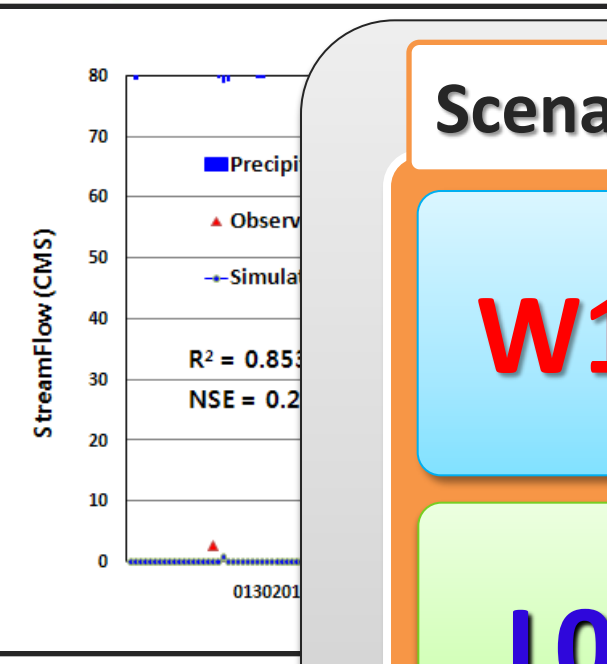
Calibration

StreamFlow
NSE = 0.662

SS
NSE = 0.688



Result of Scenario 2



Scenario2

W10

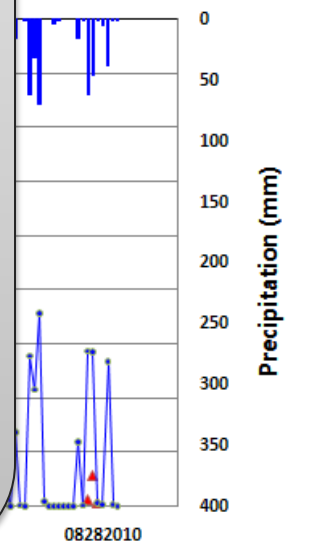
L09

Obs10

Validation

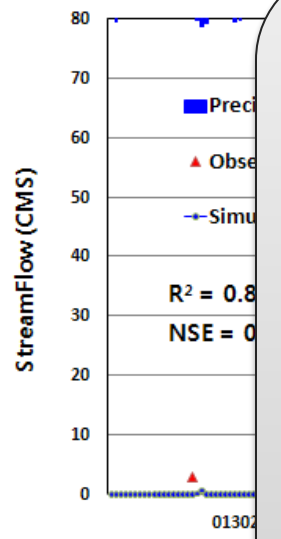
StreamFlow
NSE = 0.246

SS
NSE = -8.007



Data

Result of Scenario 3



Scenario3

W10

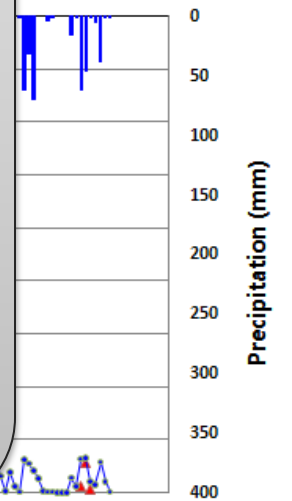
L10

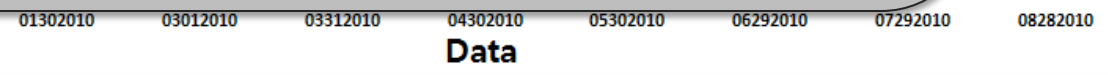
Obs10

Calibration

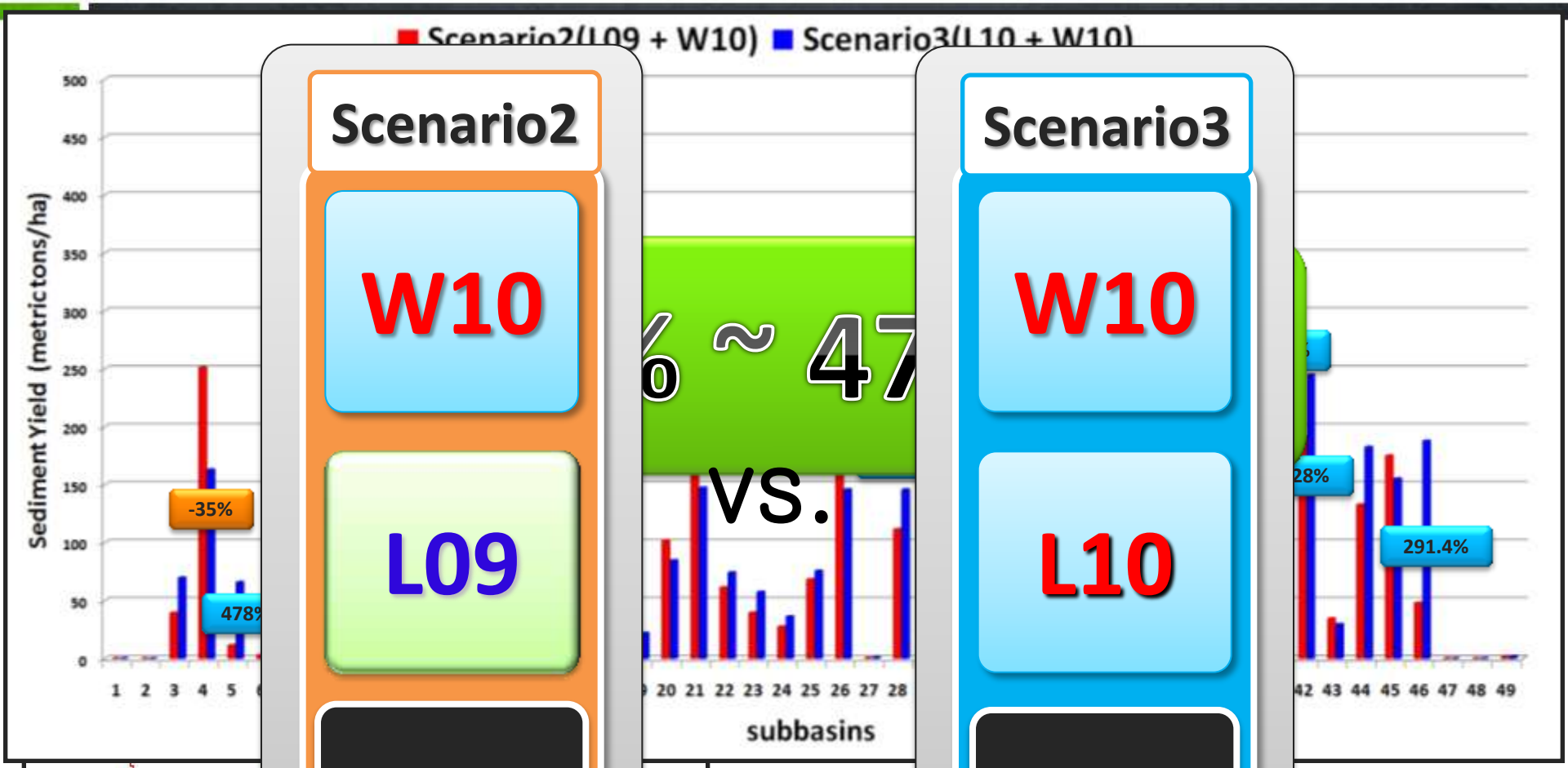
StreamFlow
NSE = 0.493

SS
NSE = 0.534





Scenario2 vs. Scenario3



Scenario2

W10

L09

Parameters
Scenario1

% ~ 47

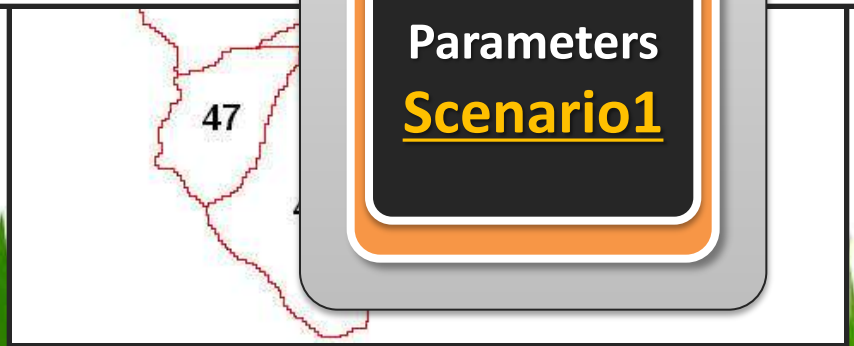
VS.

Scenario3

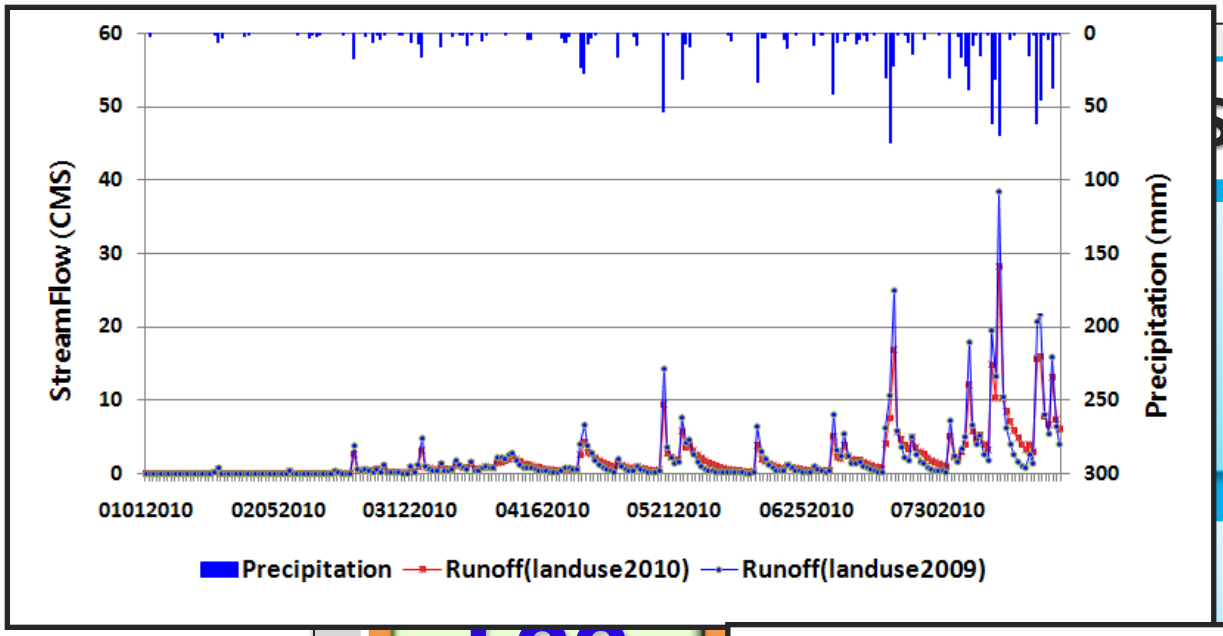
W10

L10

Parameters
Scenario3



Scenario2 vs. Scenario3

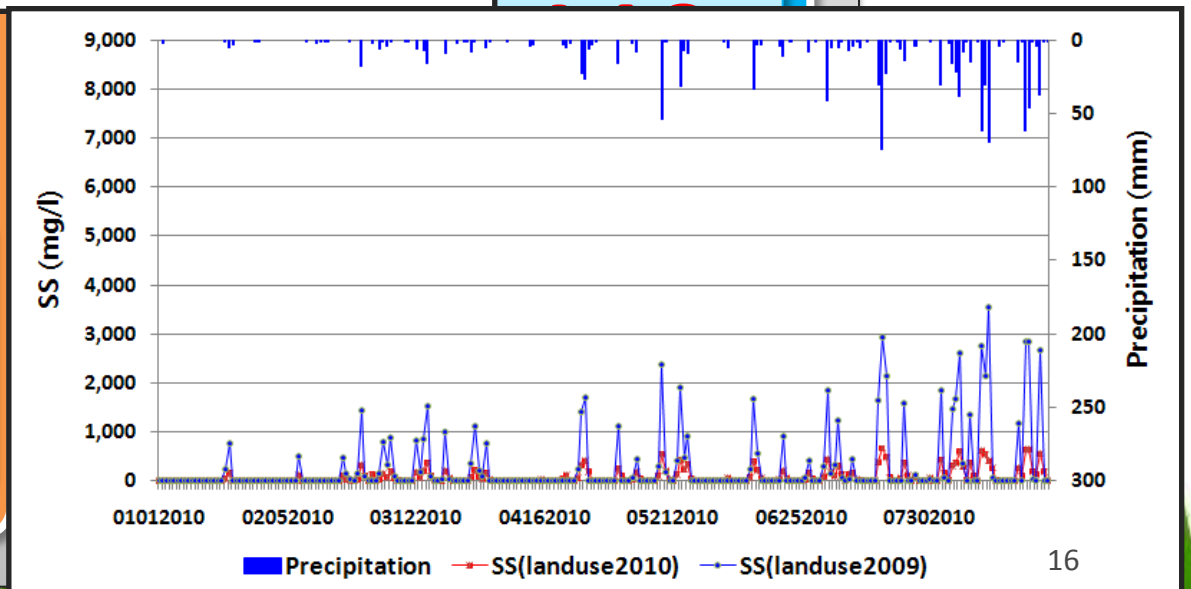


Scenario2
1.931 (CMS)

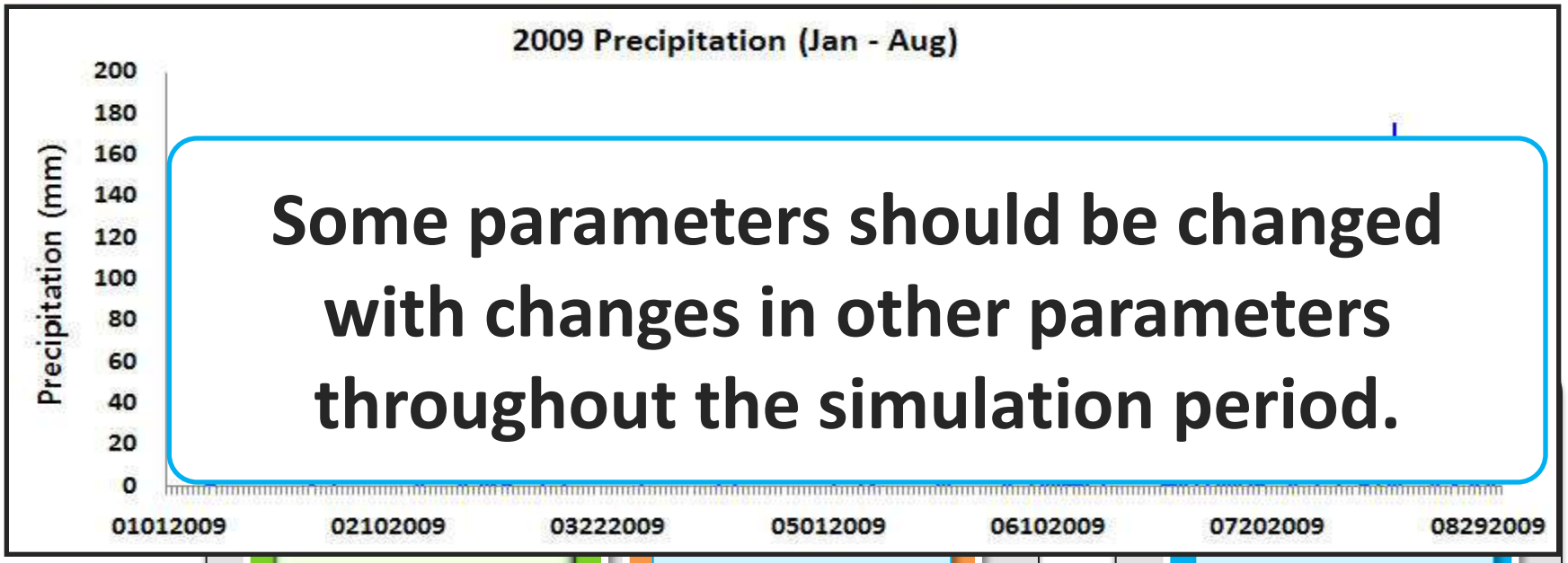
Scenario3
1.998 (CMS)

Scenario2
1,117.1 (mg/l)

Scenario3
332.7 (mg/l)

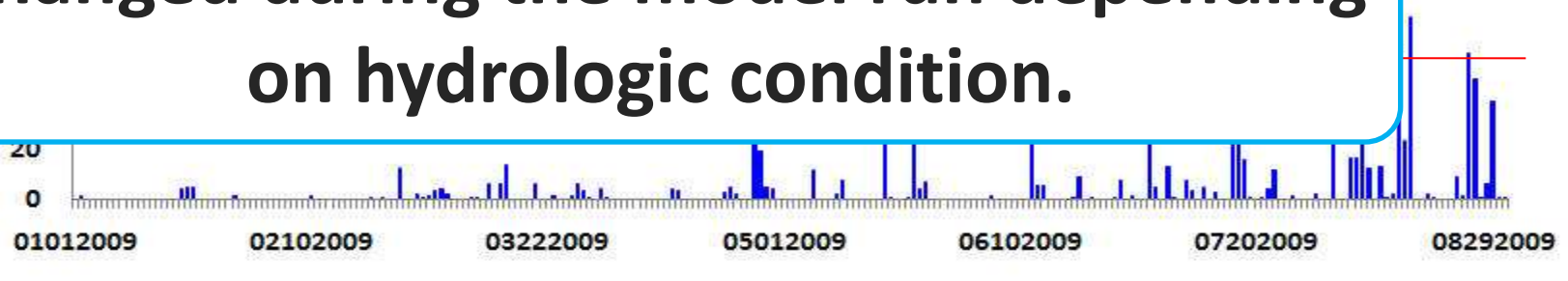


Parameters used in this study

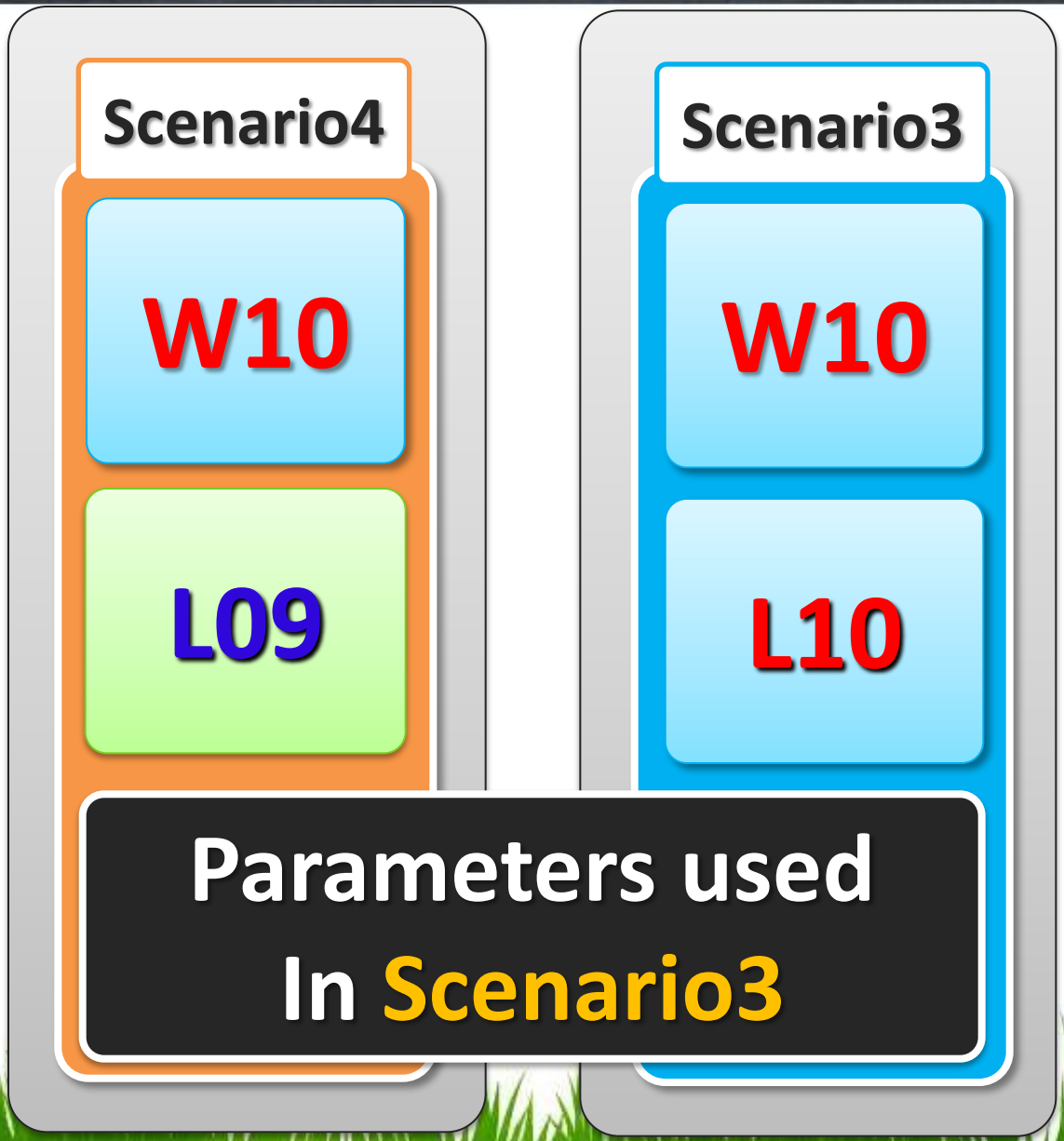


Some parameters should be changed with changes in other parameters throughout the simulation period.

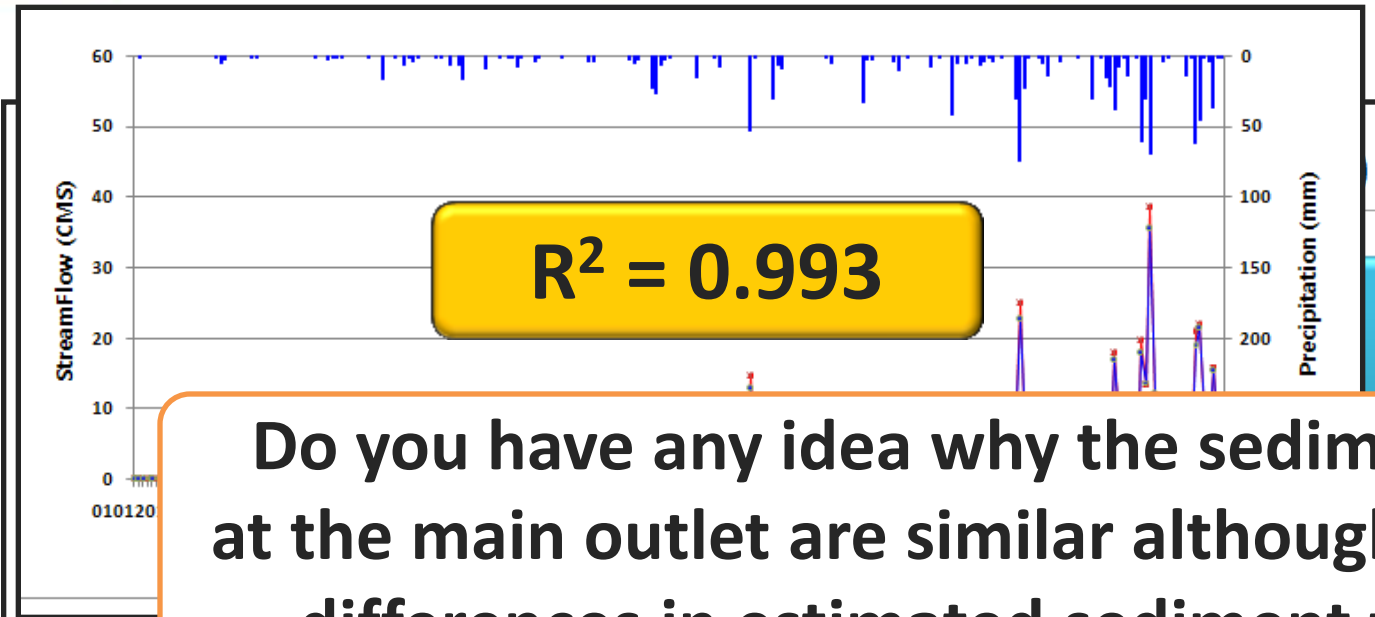
In the current SWAT, the SPCON parameter should be dynamically changed during the model run depending on hydrologic condition.



New Scenario 4



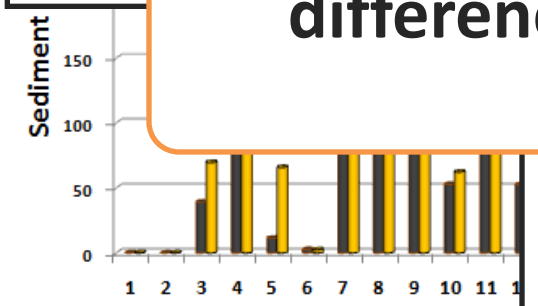
Scenario3 vs. Scenario4

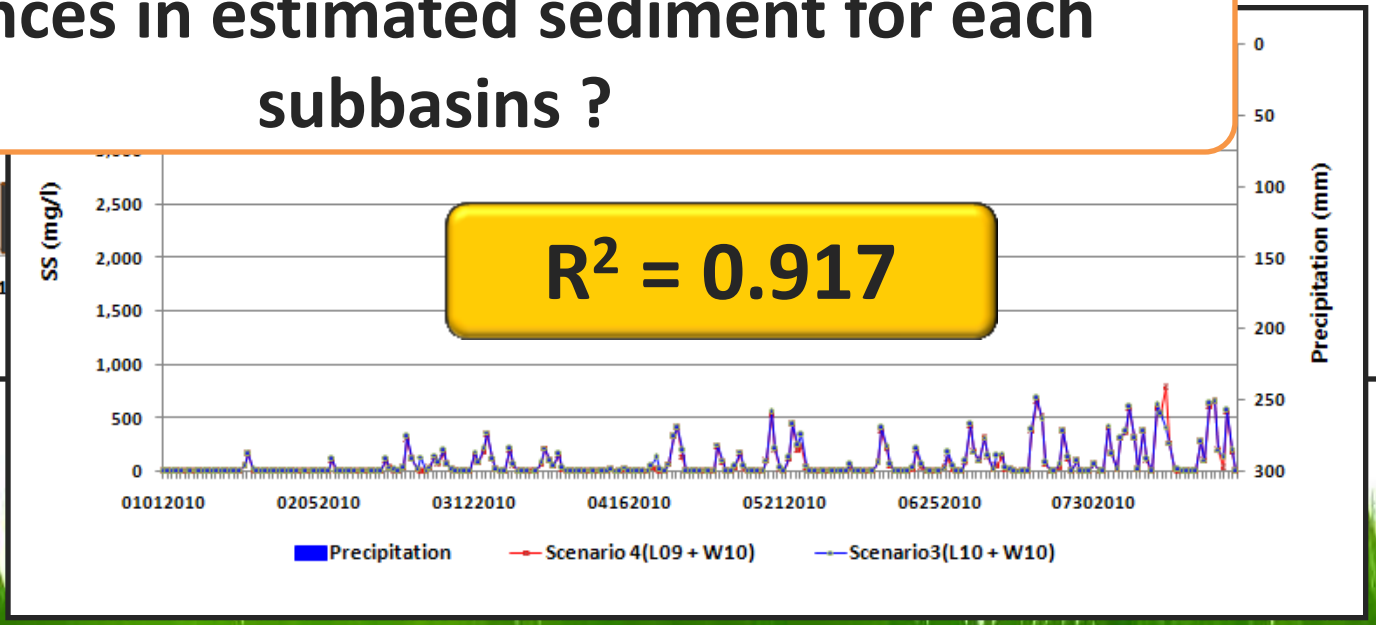


$R^2 = 0.993$

0/

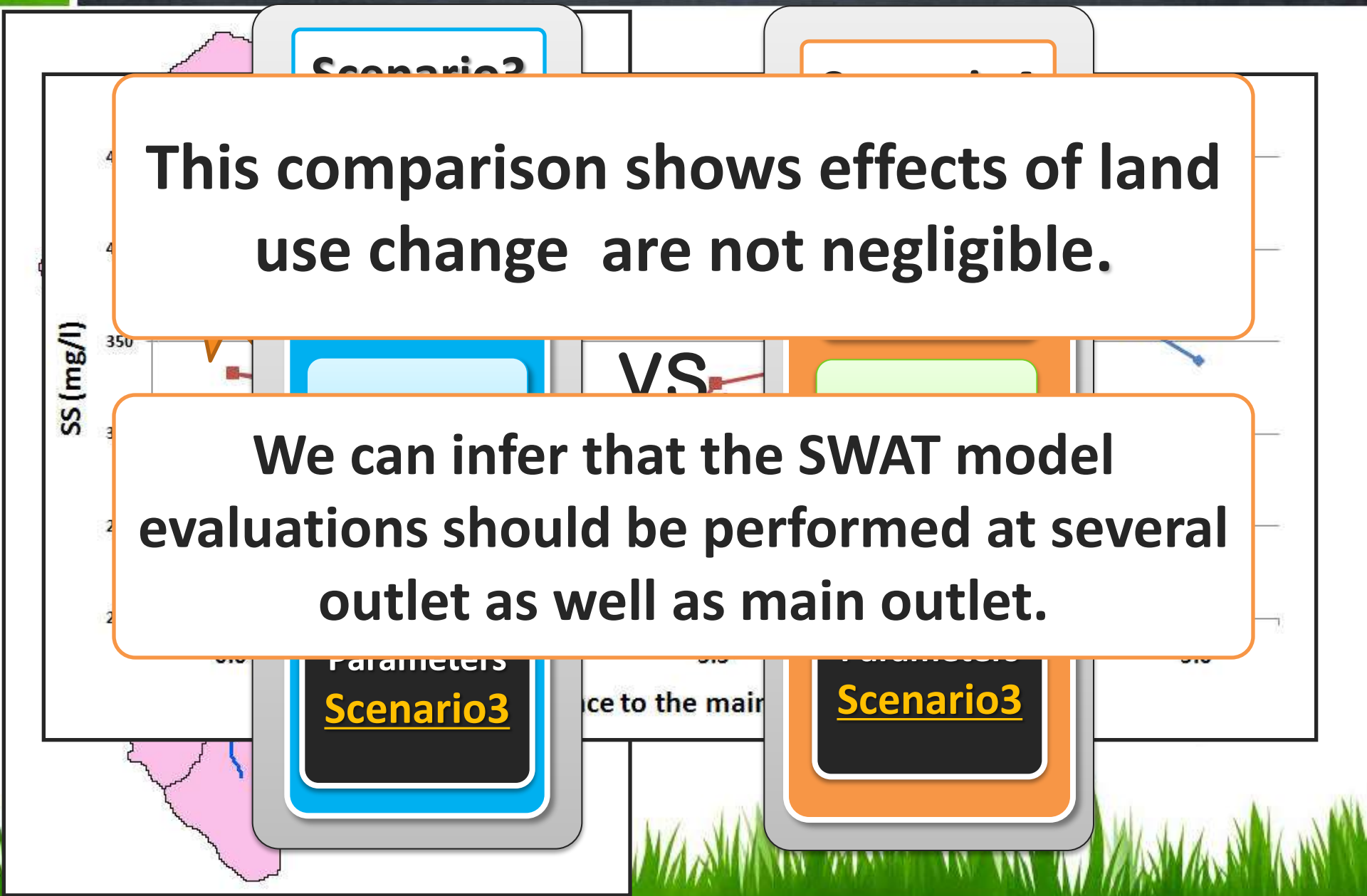
Do you have any idea why the sediment loads at the main outlet are similar although there are differences in estimated sediment for each subbasins ?





$R^2 = 0.917$

Scenario3 vs. Scenario4

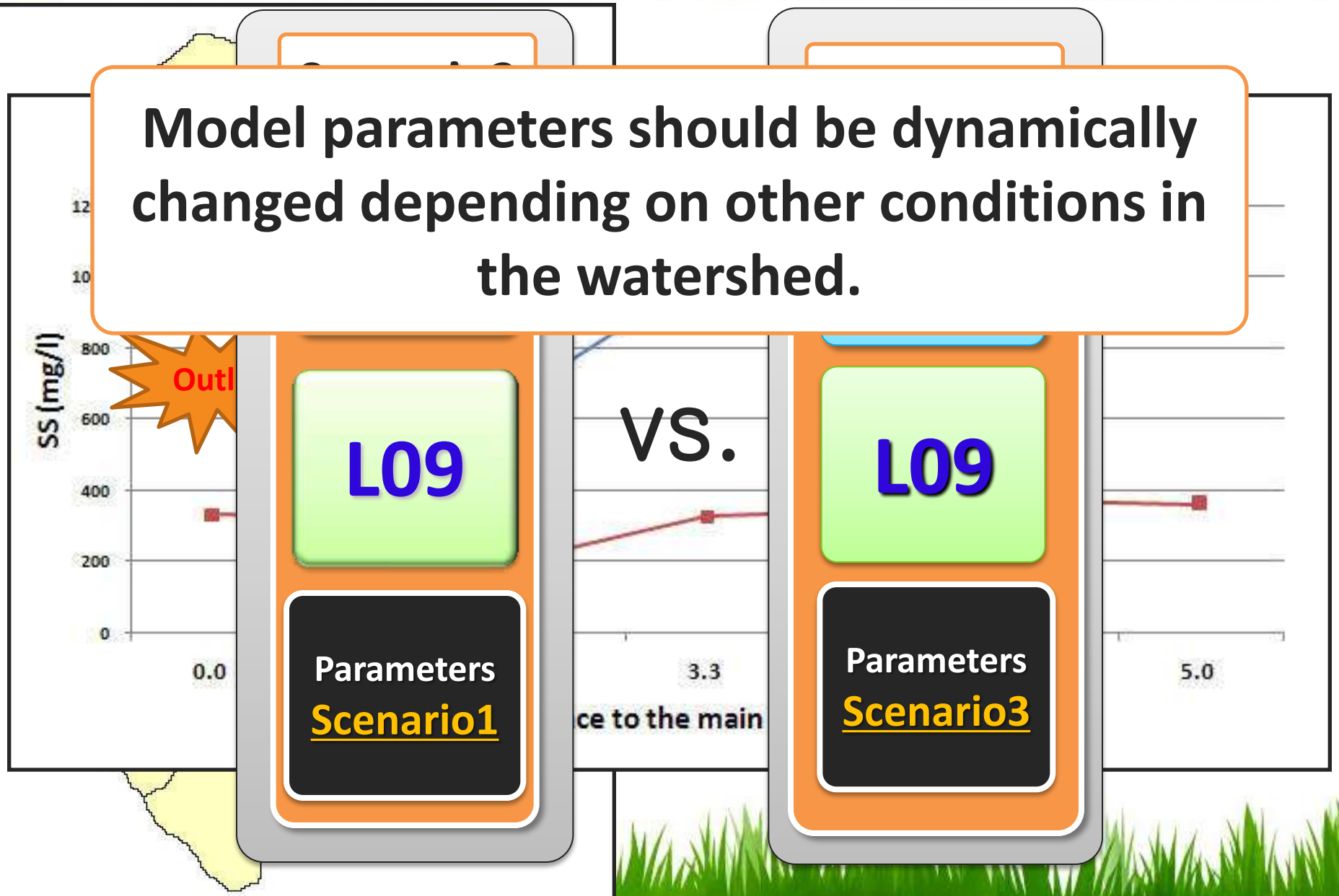


This comparison shows effects of land use change are not negligible.

We can infer that the SWAT model evaluations should be performed at several outlet as well as main outlet.

Scenario2 vs. Scenario4

Model parameters should be dynamically changed depending on other conditions in the watershed.



Conclusions

- We strongly recommend SWAT model should be calibrated for several locations (outlets) as well as main outlet in the watershed

- However, some model parameters depending on various field/weather condition should be dynamically changed for better estimation of what has been occurring at the watershed through calibration / validation period.

- If changes in land use (cropping) and weather are not negligible, what is your strategy to evaluate model performance? (any good idea/comments ?)

Thank you for your attention!!!!

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