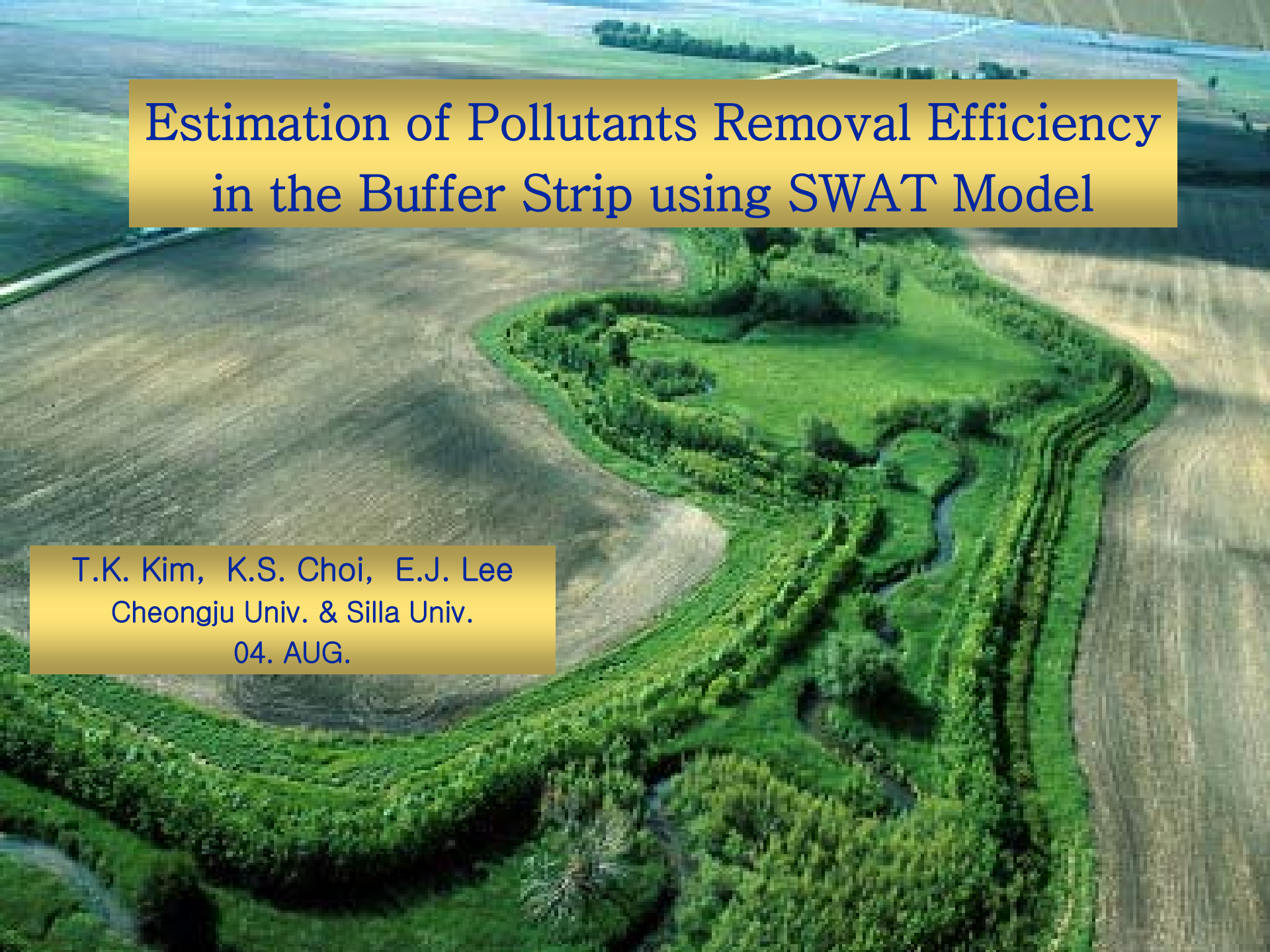


Estimation of Pollutants Removal Efficiency in the Buffer Strip using SWAT Model

T.K. Kim, K.S. Choi, E.J. Lee
Cheongju Univ. & Silla Univ.
04. AUG.

Back ground

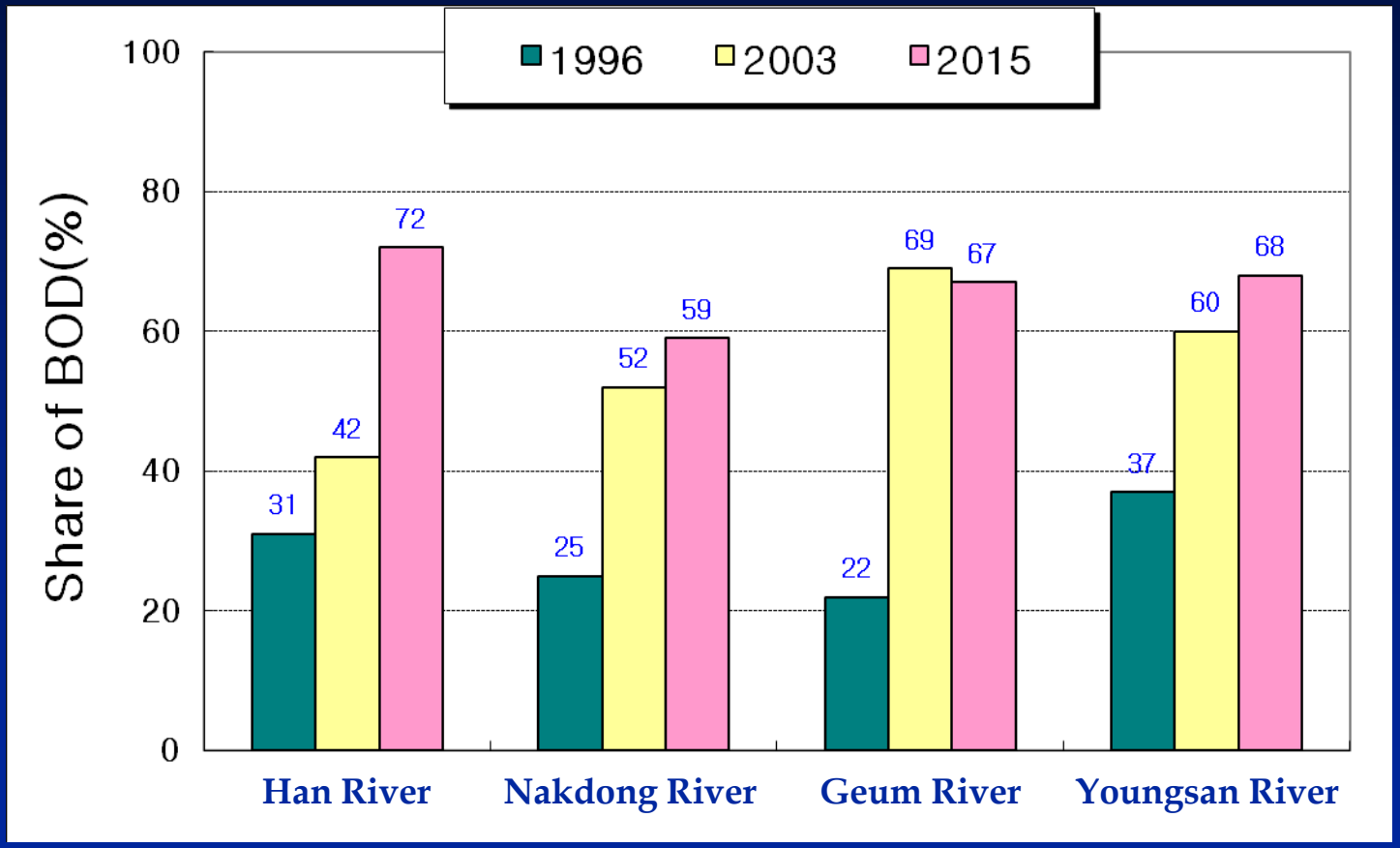
1. Necessity of Non-point source control
   - ☞ Total Loads control application, Increase of water pollutants, Prediction of water quality
     - ☞ TP control area for 2nd Total Maximum Daily Load(TMDL) in Korea
   - ☞ Point source control area so far

2. Lack of non-point source data
   - ☞ Measurement data

3. Insufficient information of pollutant contribution in the Yongdam reservoir
   - ☞ no determination of relation between eutrophication and non-point sources in the area

4. Requirement of Watershed management
   - ☞ difficulty of measurement during the rainfall
   - ☞ Estimation of pollutant loads for the total load control
   - ☞ Comprehensive model requirement

Contribution of Non-point pollutants

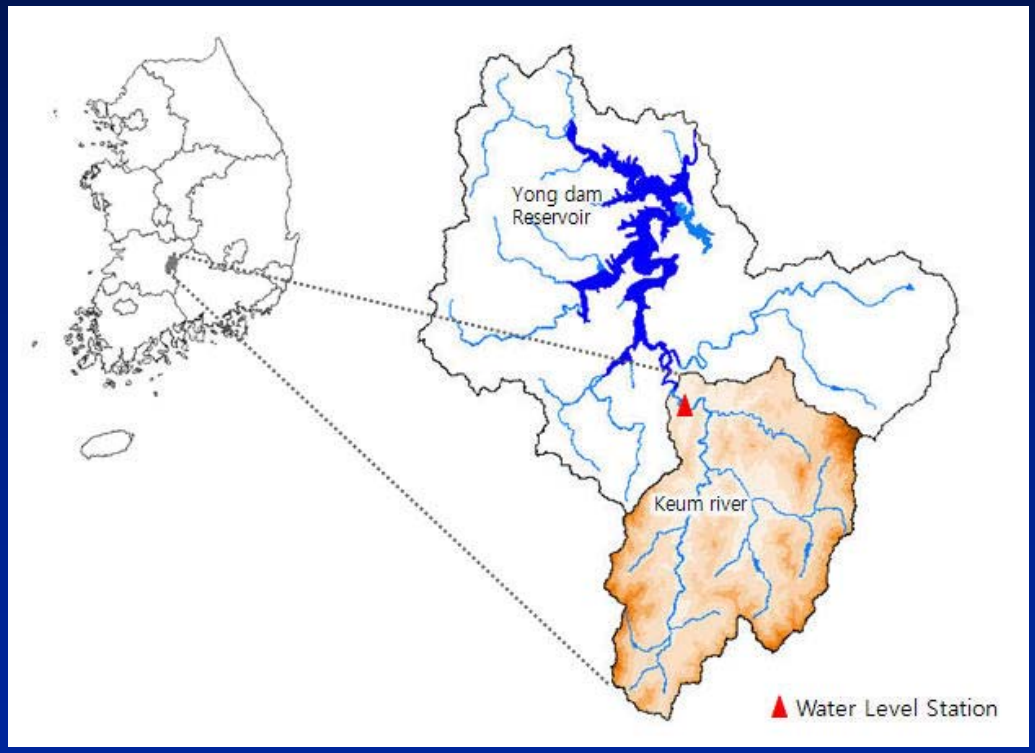


Objectives

1. Quantities of water pollutants with rainy days and dry days

2. Construction of buffer strips by the change of land use inputs in SWAT and then estimate the removal rate of water pollutants

Study Area



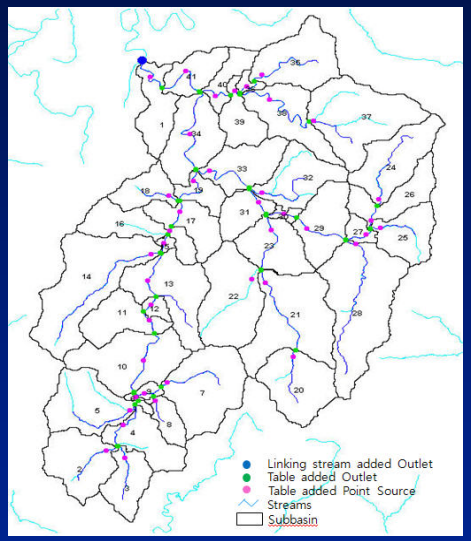
Selection

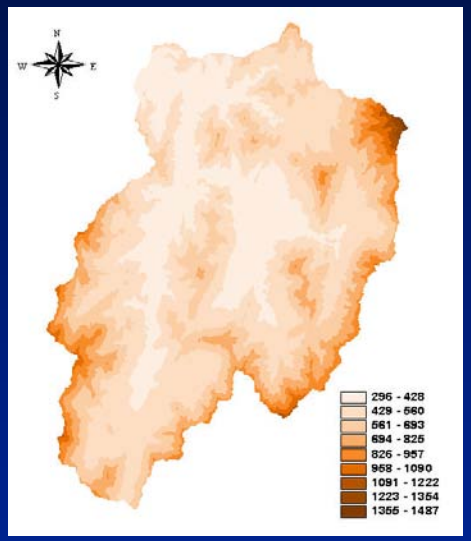
- Water Use (Importance)
- Difficulty for watershed Management
- Non-point source Contribution

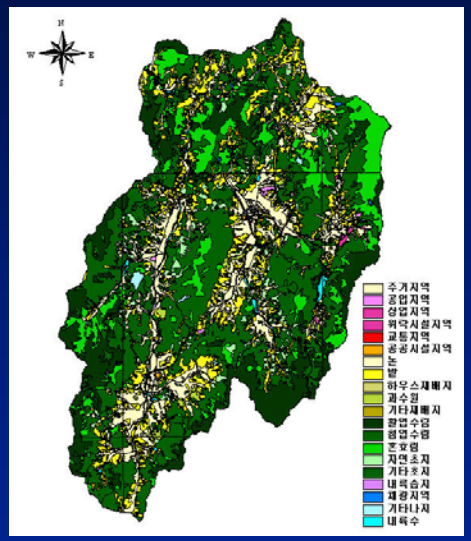
※ Total Maximum Daily Load(TMDL) area For TP

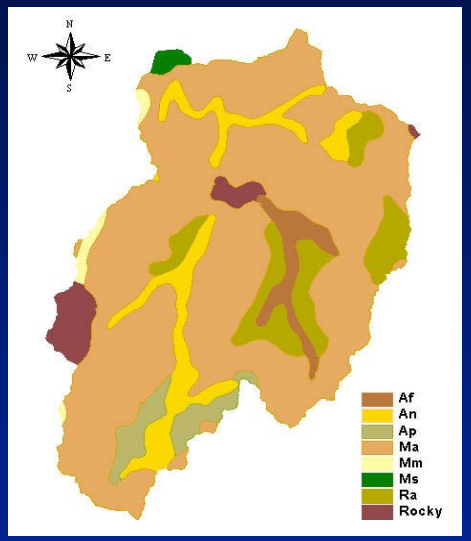
Area : 299.5 ㎢

Input Data –Geomorphic Data







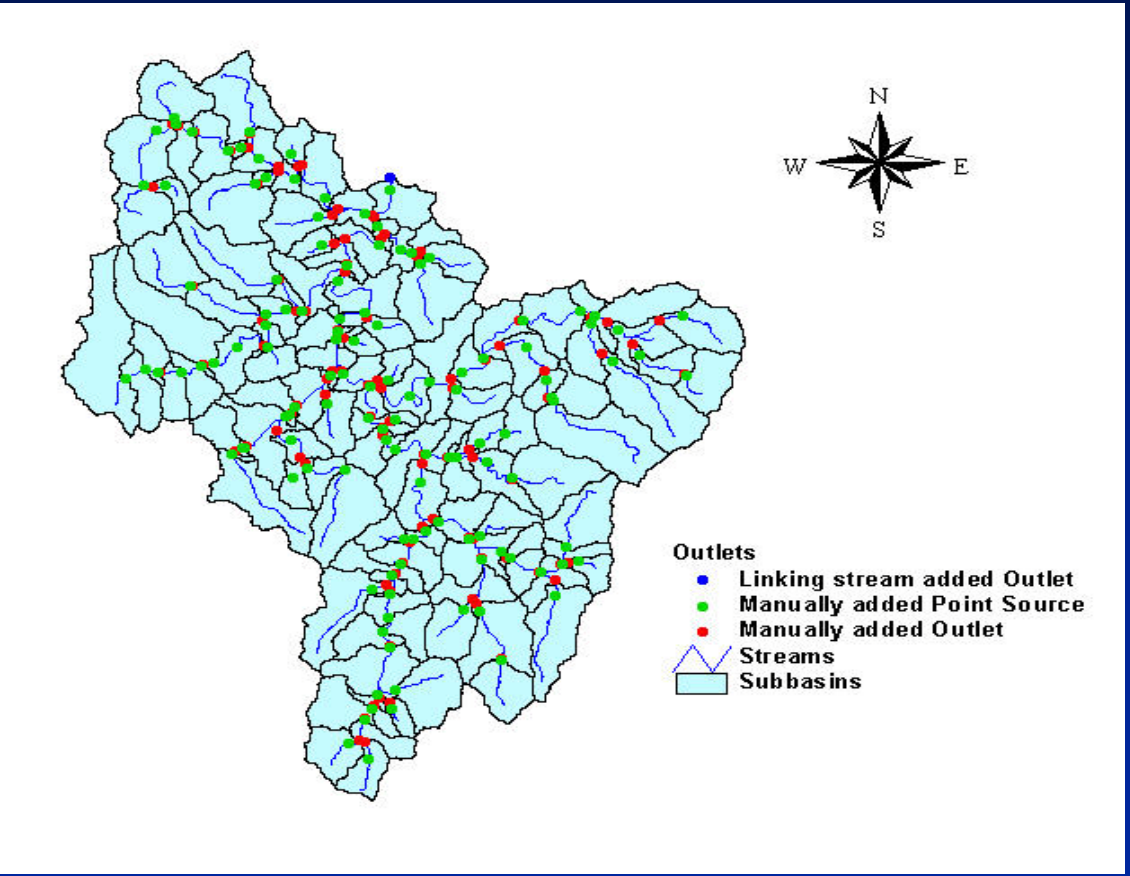


Delineation **DEM** **Landuse** **Soil**

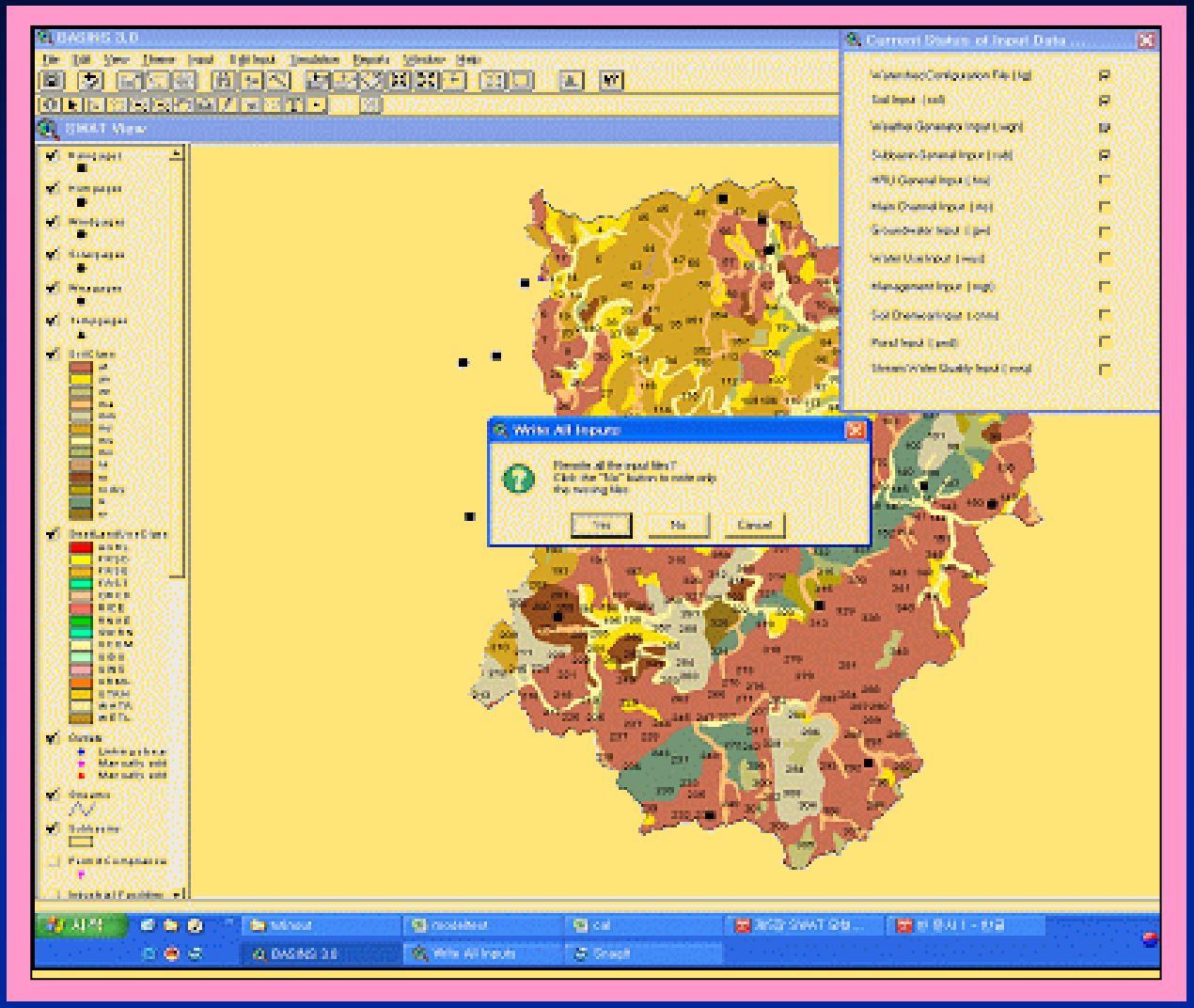
Digitized Drainage

Method

: Adjustment of threshold and outlet in SWAT



Input Data in SWAT



Calibration & Validation in Model

Calibration and Validation

Calibration data

- Runoff： water level data in 2007 from Kwater Corp.
- Water Quality ： Guem River Environment Research Center in 2007

Validation data

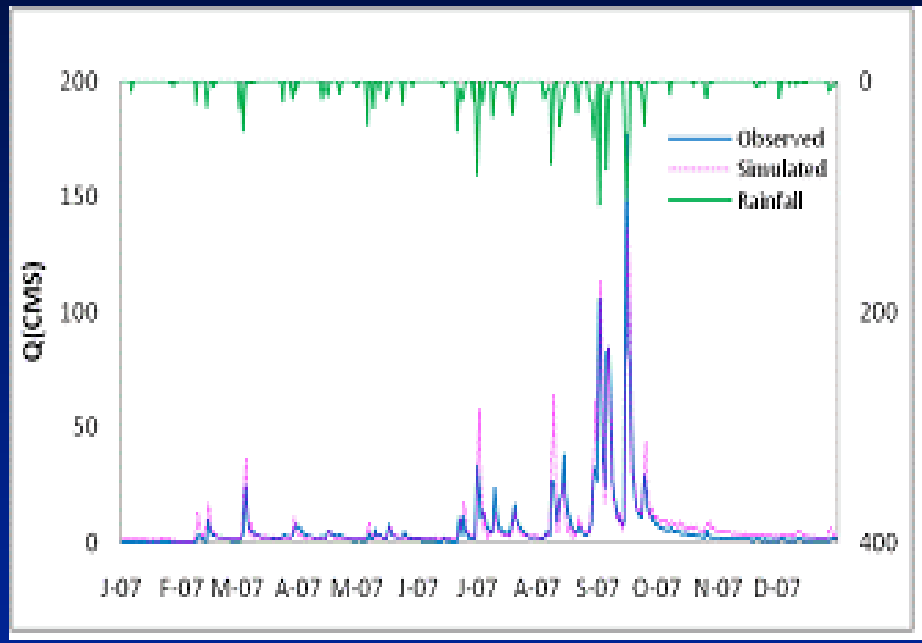
- Runoff：water level data in 2006 from KWater
- Water quality： Guem River Environment Research Center in 2006

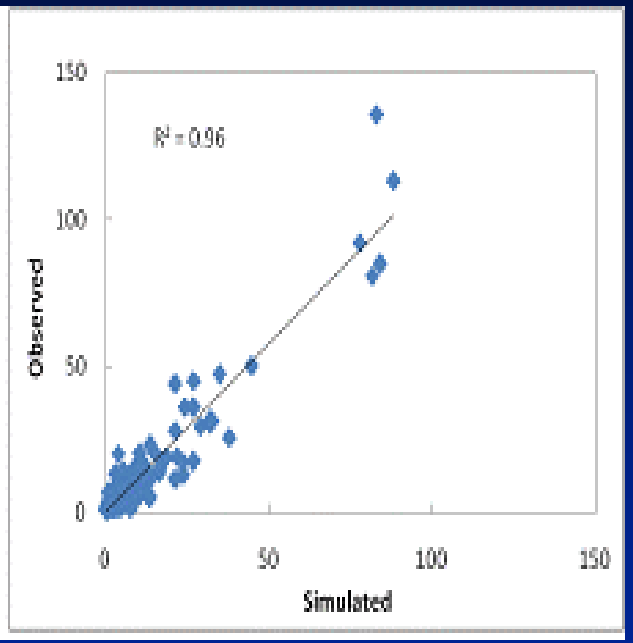
Sampling Site

- Water Level Station of Kwater Corp. at Cheon-cheon

Calibration

Cheon-cheon in 2007



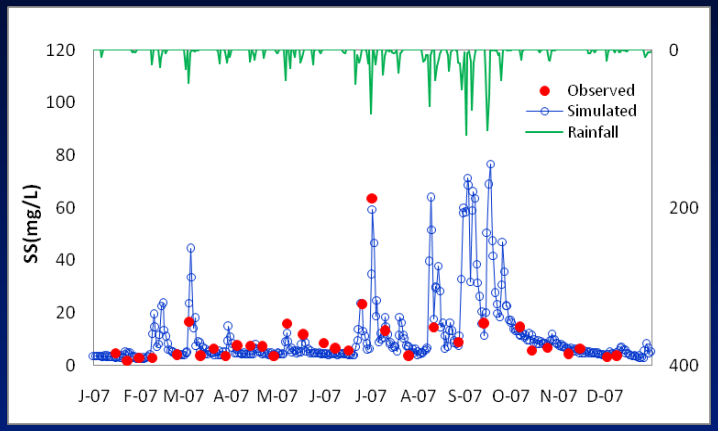


Calibration of Runoff

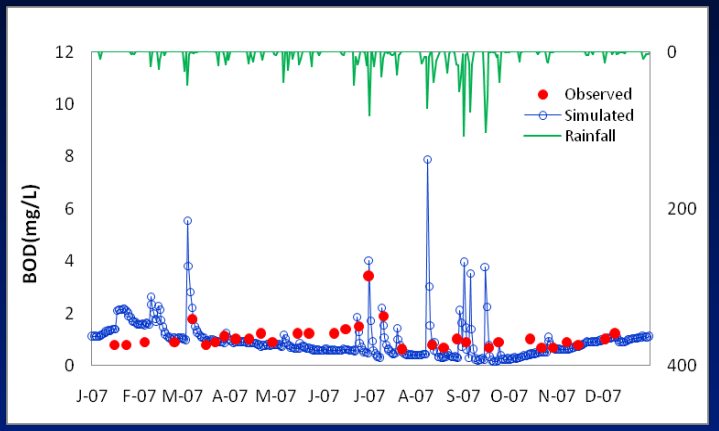
R^2=0.96

Calibration

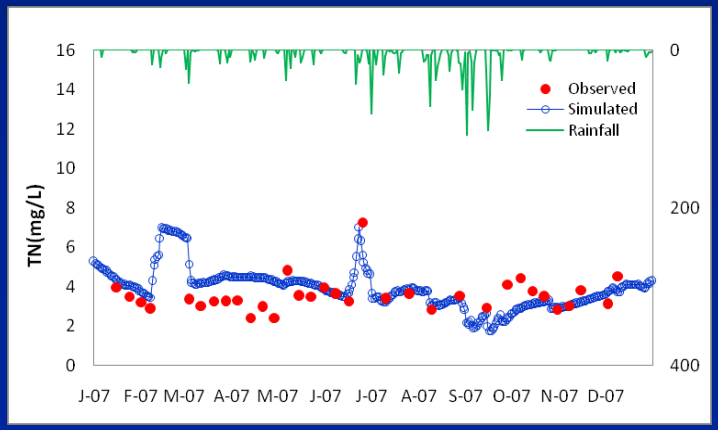
Cheon-cheon in 2007



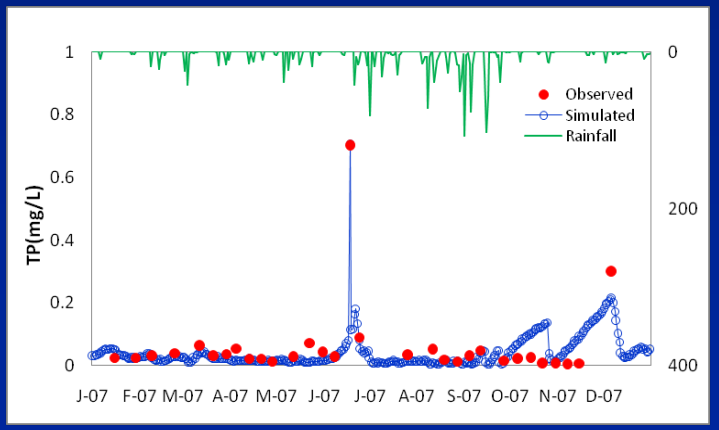
SS R^2=0.91



BOD R2=0.59



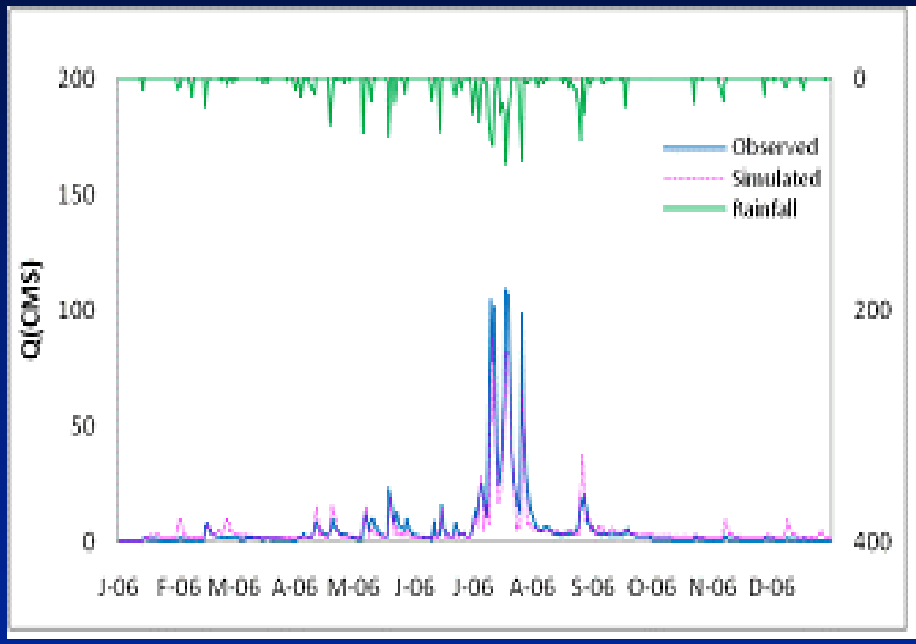
TN R2=0.42

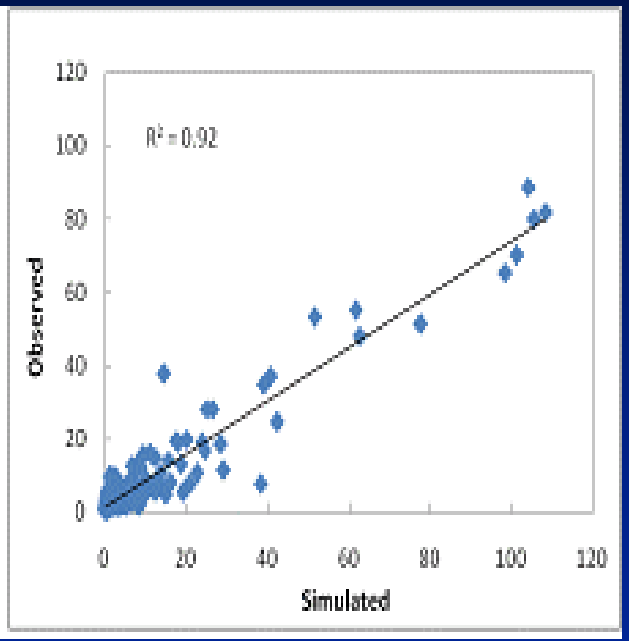


TP R2=0.90

Validation

Cheon-cheon in 2006



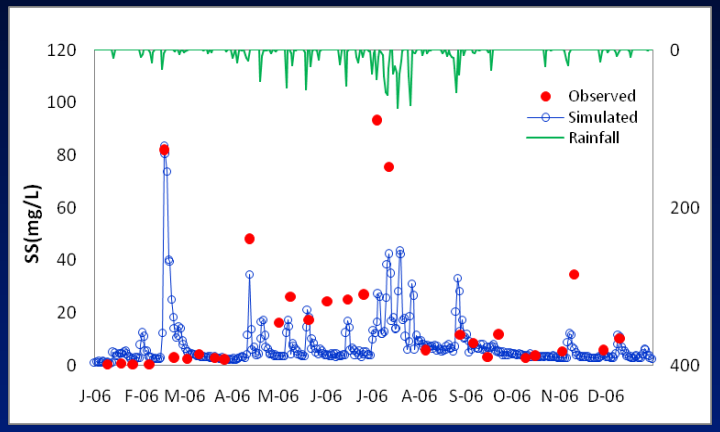


Validation of Runoff

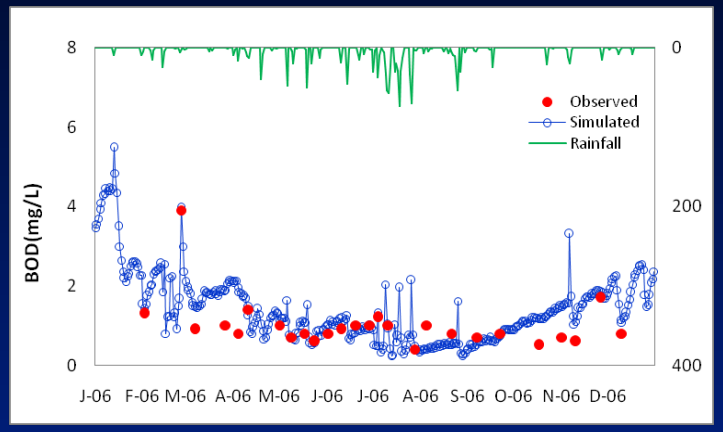
R2=0.92

Validation

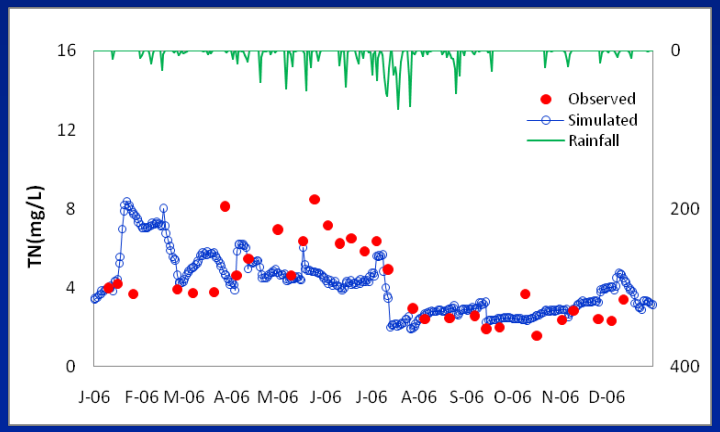
Cheon –cheon in 2006



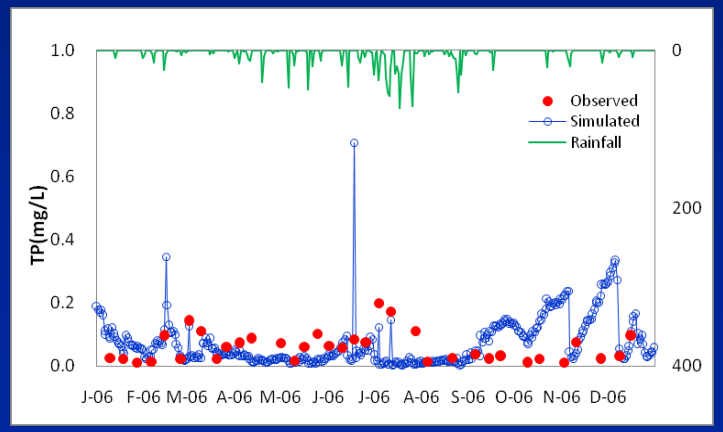
SS R2=0.49



BOD R2=0.72



TN R2=0.22



TP R2=0.26

Estimation of Pollutants Removals in SWAT

Removal Rate using Buffer Strip

- Objectives

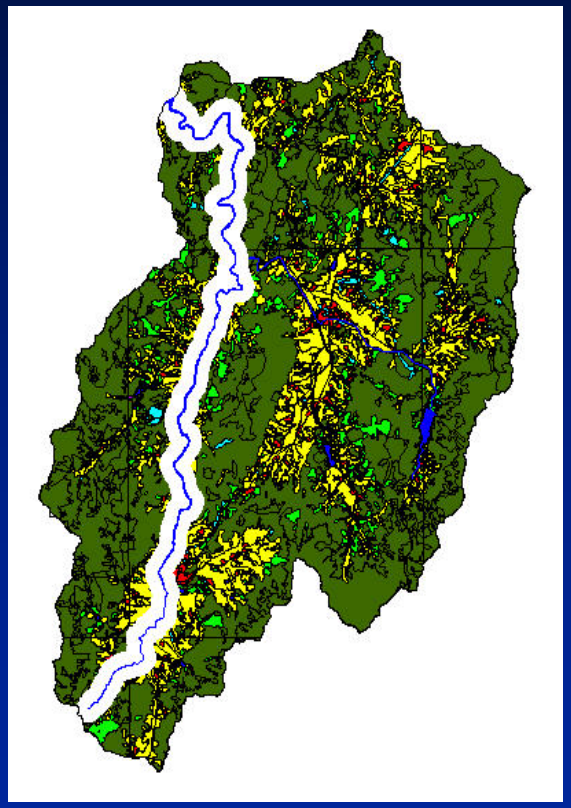
  : Quantity of pollutants removal in buffer strip

- Method

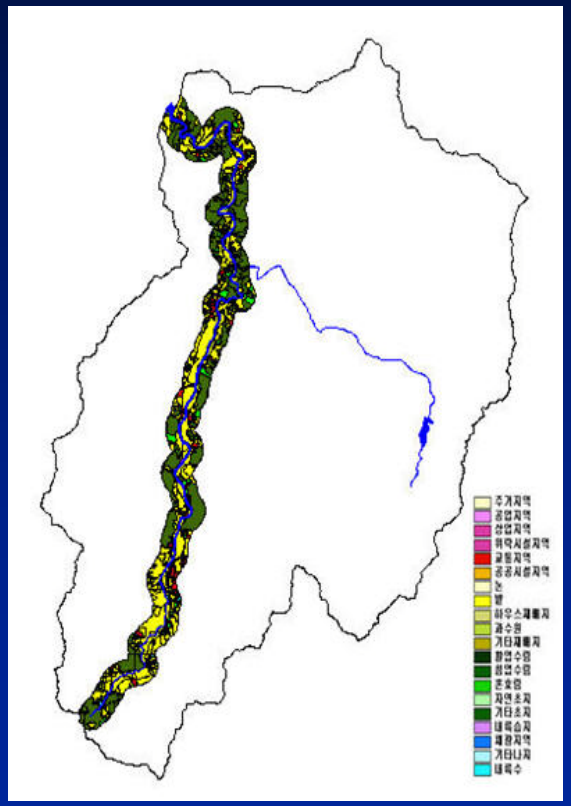
  : Assumption of land use changes into the grass from agricultural sites and non business purpose land

  - Designed with 500m along the river
  - Use the function of ' create buffers ' in ArcView GIS 3.2a with scale of 1/25,000 map

Modification of Buffer Strip



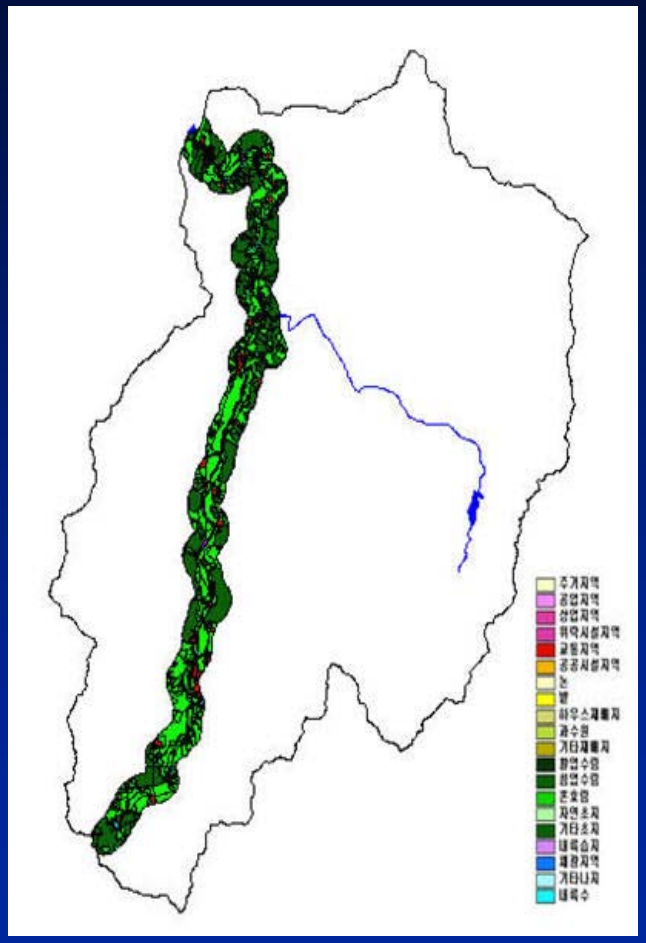
Riparian



Buffer Strip

Land-Use Pattern

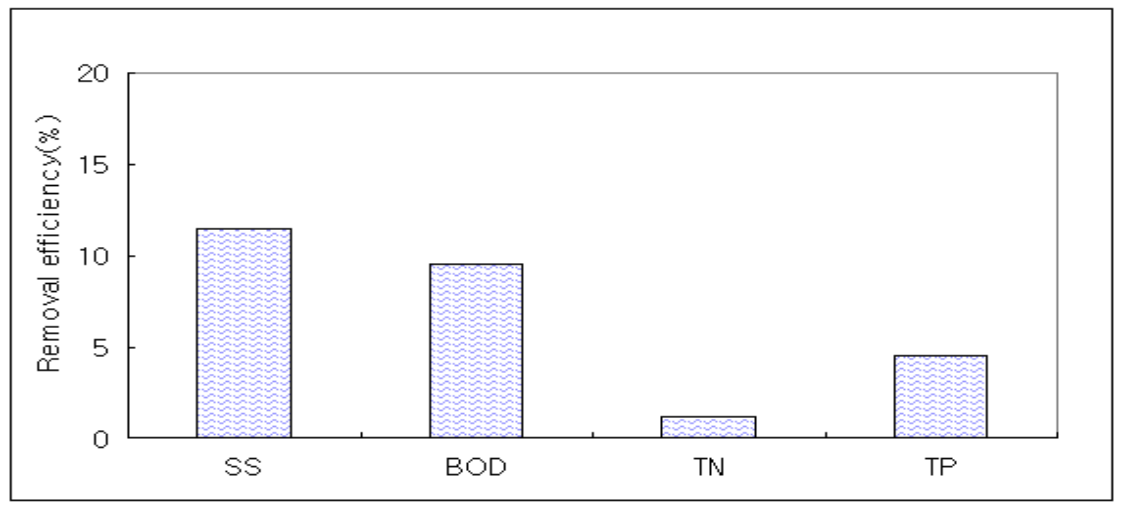
Landuse	Before	Proportion(%)	After	Proportion(%)
Paddy	7.97	26.49%	0.00	0.00%
Field	6.40	21.22%	0.00	0.00%
Forest	13.21	43.87%	27.64	91.81%
Wetland	0.61	2.03%	0.61	2.03%
Mining area	0.00	0.00%	0.00	0.00%
Bare patches	0.07	0.23%	0.00	0.00%
Others	1.85	6.16%	1.85	6.16%
Total	30.11	100.00%	30.10	100.00%



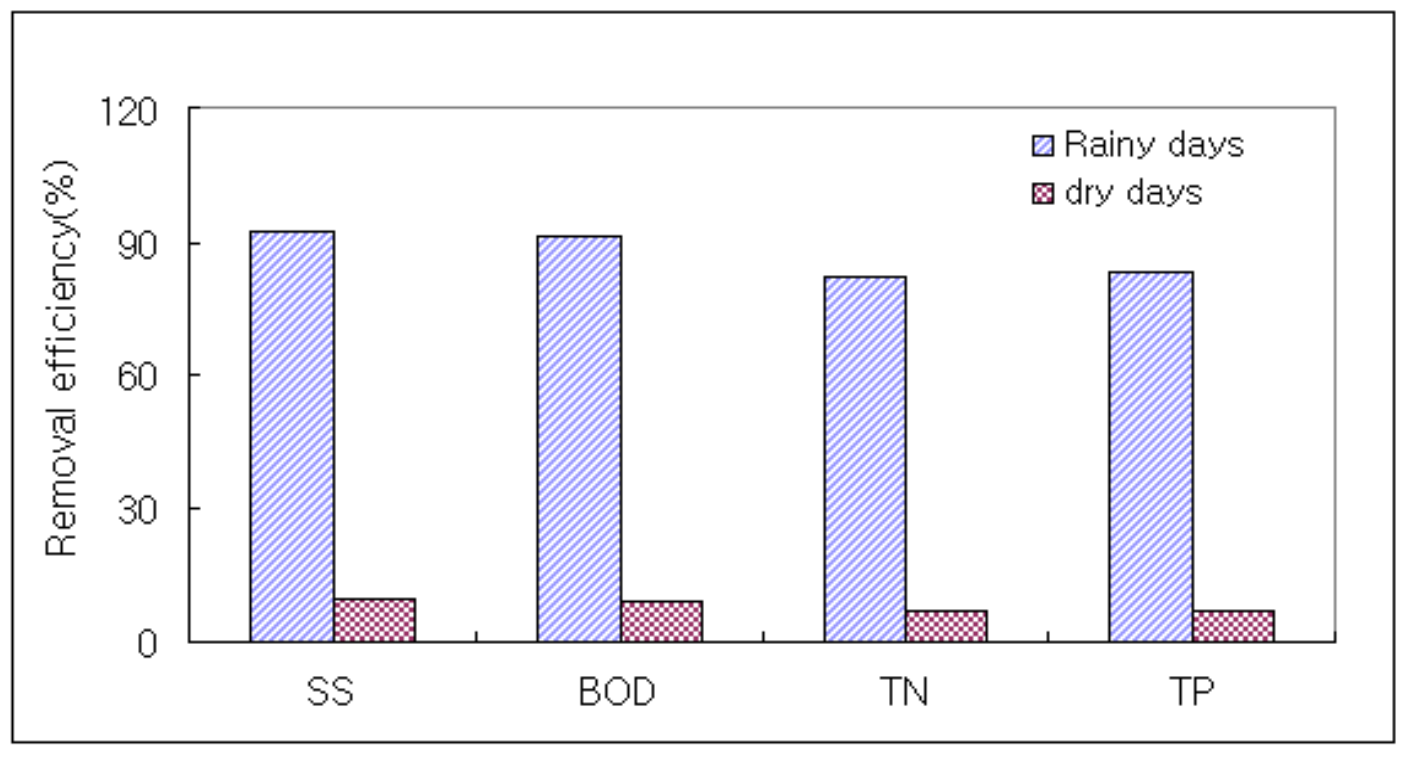
Change of Landuse

Pollutants Removal

Type (ton/yr)	SS	BOD	TN	TP
Before buffer strip structure	8,215.3	435.8	547.9	10.1
After buffer strip structure	7,270.5	394.4	541.3	9.6
Removal rate (%)	11.5	9.5	1.2	4.5



Pollutants Removal



Conclusions

1. The study assumptions,
   removal rates 11.5% of SS, 9.5% of BOD, 1.2% of TN, 4.5% of TP
   under the rainfall conditions of 2007.

   During the rainy days,
   92.3 % of SS, 91.2% of BOD, 82.4% of TN, and 83.5% of TP.

2. Rainfall
   - soil erosions
   - increase the SS concentrations.

3. The construction of buffer strips
   protect the SS inflows into the streams.


Thank You