GIS Application in Water Balance Modelling

By Hassan A. Eltoum
ID #240350
For
CRP 514: Introduction to GIS
Term 051 – 12th Offer

Outlines

- Introduction
- Problem Statement
- Objectives
- Methods
- Discussion
- Summary

Introduction

- Hydrological Assessment to represent hazard .
- Hydrological Parameter Determination,
- Hydrological Modelling within the GIS, provides feasible time
- Linking the GIS and hydrological model.

Problem Statement

- Big demand for the special analysis
- Demand reflect on the need of water balance modeling
- better look to analysis any problem in water resources

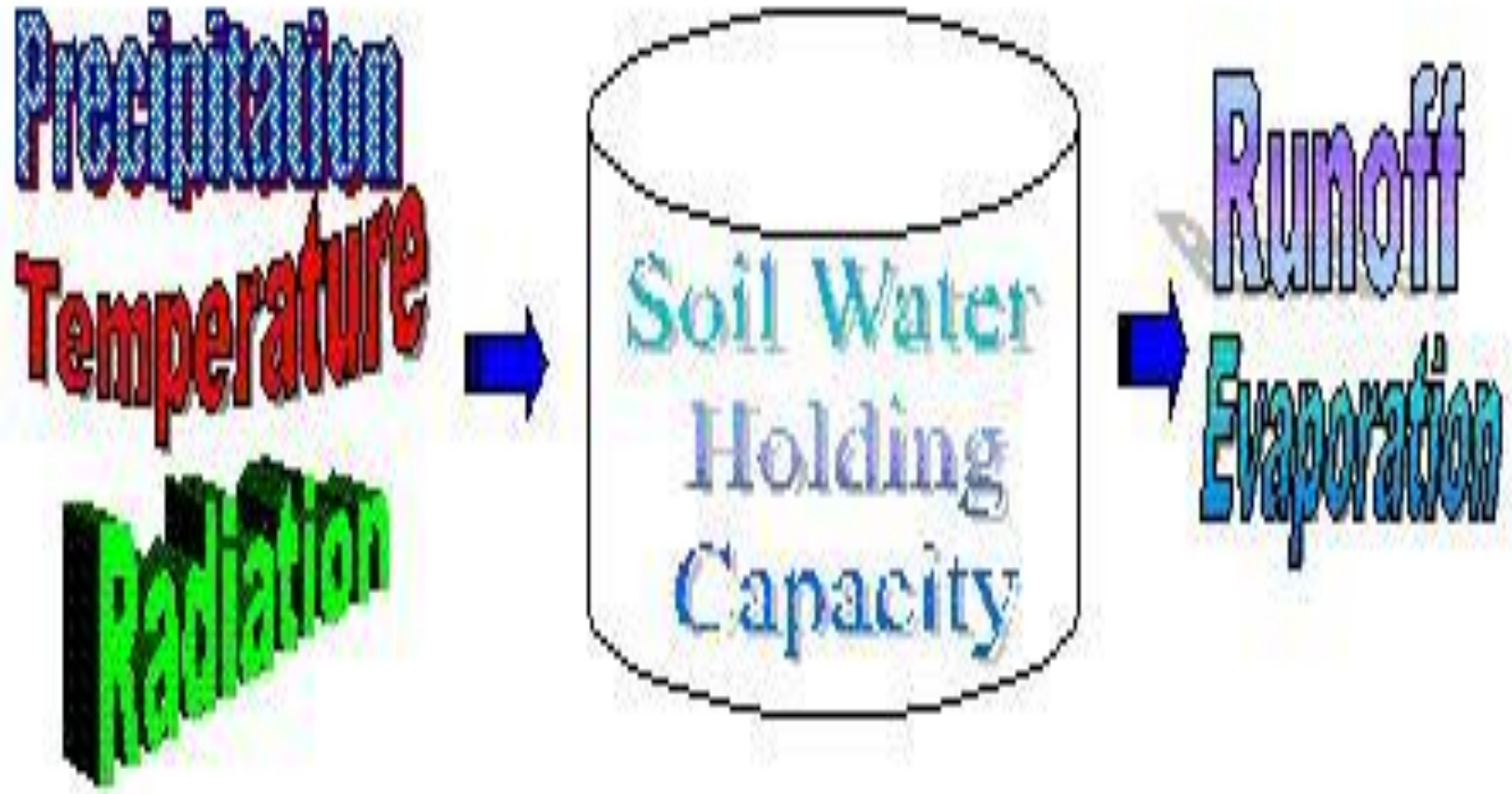
Objectives

1- Elaborate on general idea for modeling water balance and,

2- have a look to developing tools for predicting hydrographs and pollution

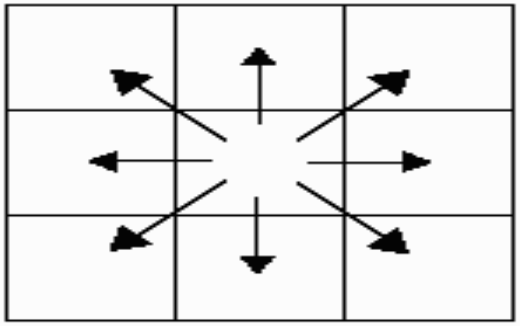
Methods

- (1) DEM processing,
- (2) selecting a set of flow gages spanning the appropriate period of record,
- (3) Compiling Watershed Attributes
- (4) determining the average annual precipitation in each watershed,
- (5) determining the net measured inflow to each watershed,
- (6) compiling a set of watershed attributes including percent urbanization, reservoir evaporation, recharge, and spring flow,
- (7) plotting runoff per unit area versus rainfall per unit area and deriving an "expected" runoff function, and
- (8) creating grids of expected runoff, actual runoff, and evaporation.


Precipitation
Temperature
Radiation
Soil Water
Holding
Capacity
Runoff
Evaporation

(1) DEM processing

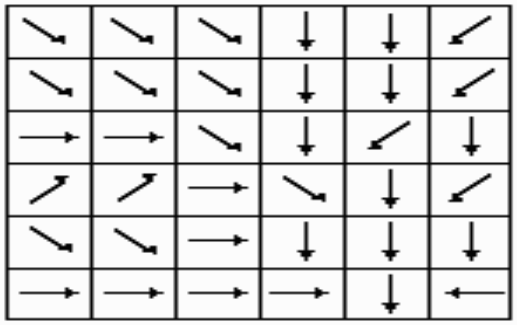
(a) Eight-direction Pour Point Model



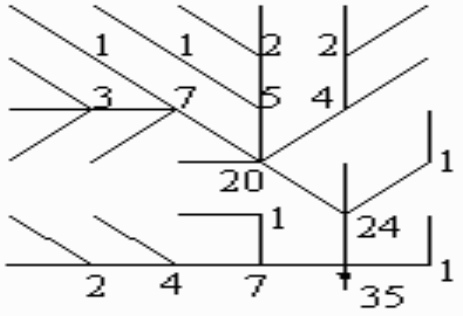
(b) Grid of Terrain Elevations

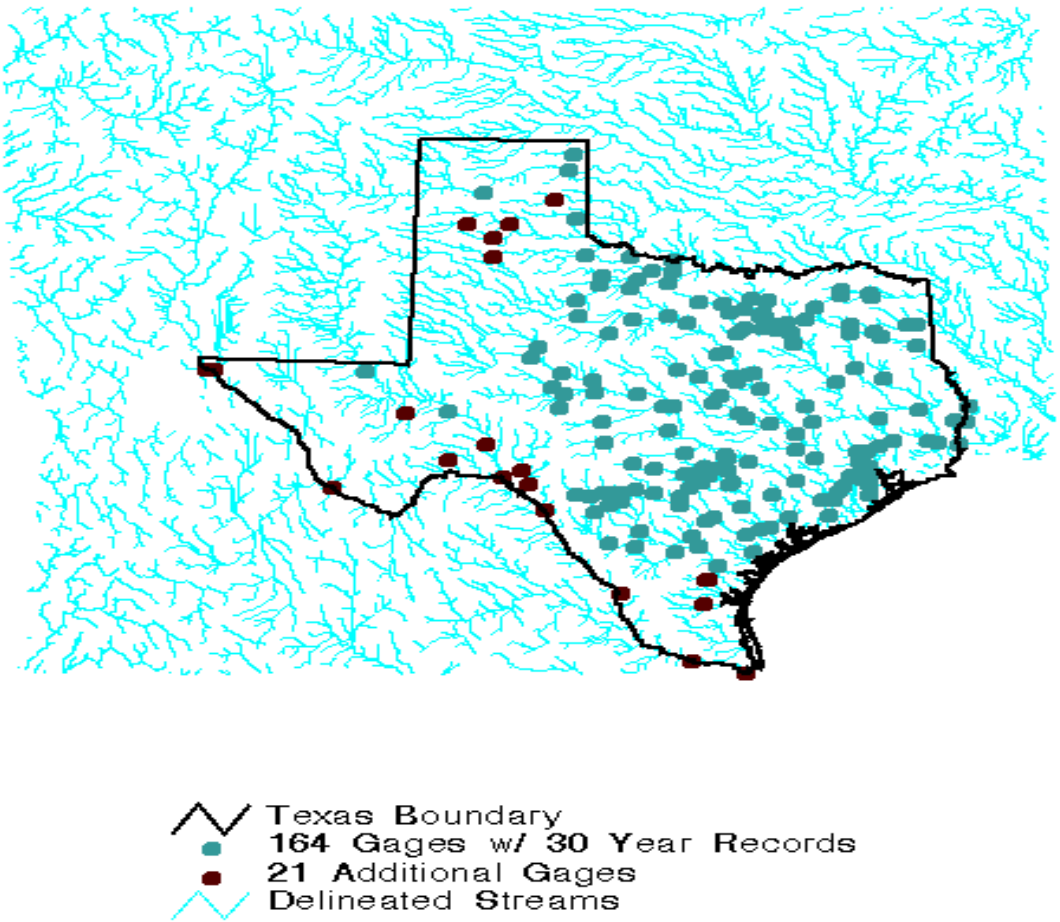
78	72	69	71	58	49
74	67	56	49	46	50
69	53	44	37	38	48
64	58	55	22	31	24
68	61	47	21	16	19
74	53	34	12	11	12

(c) Grid of Flow Directions

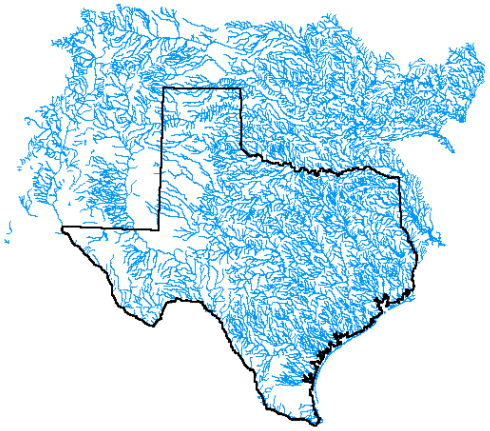


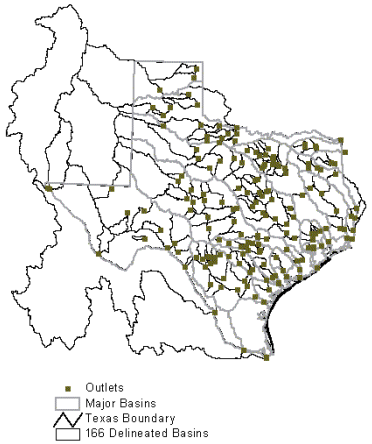
(d) Drainage Network Showing Flowaccumulation

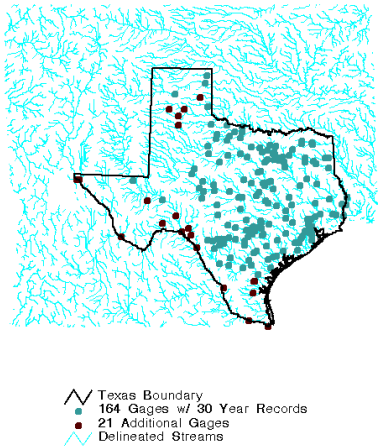


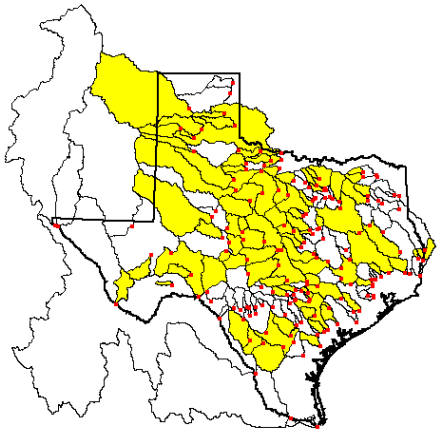

Texas Boundary
164 Gages w/ 30 Year Records
21 Additional Gages
Delineated Streams

Steps of DEM

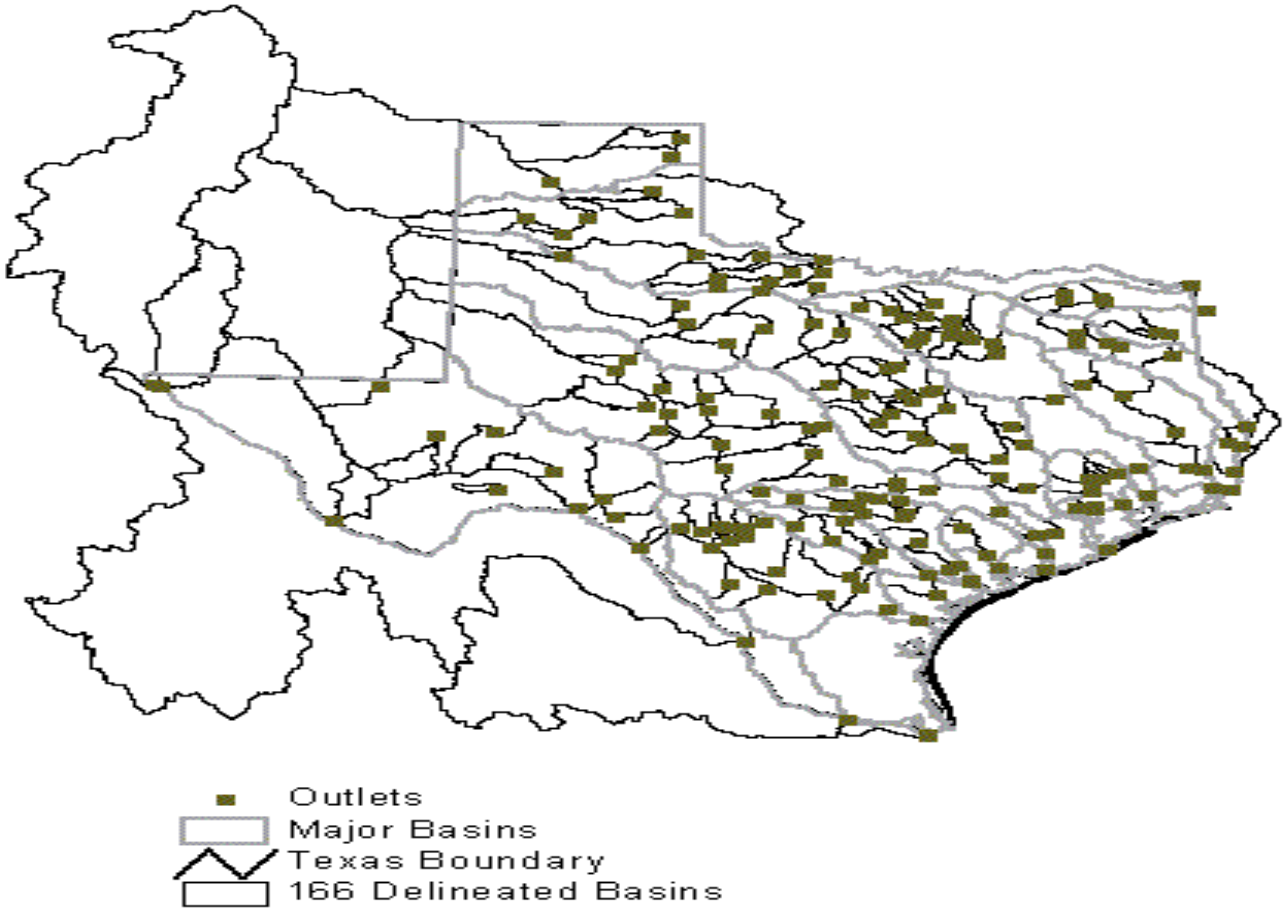



Outlets
Major Basins
Texas Boundary
166 Delineated Basins

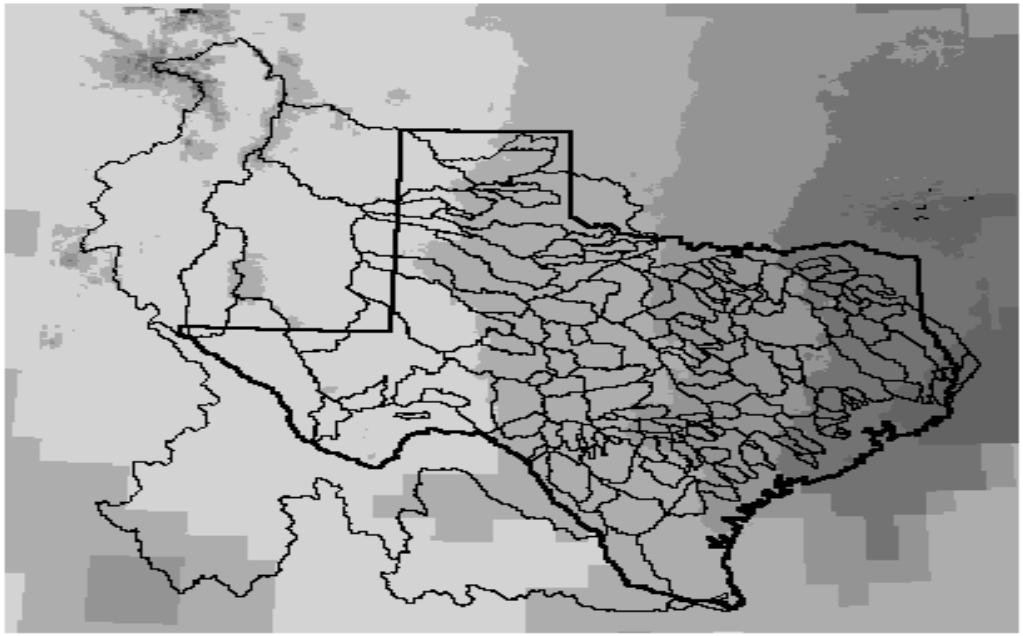

Texas Boundary
164 Gages w/ 30 Year Records
21 Additional Gages
Delineated Streams



Delineating Watersheds from Selected Gages

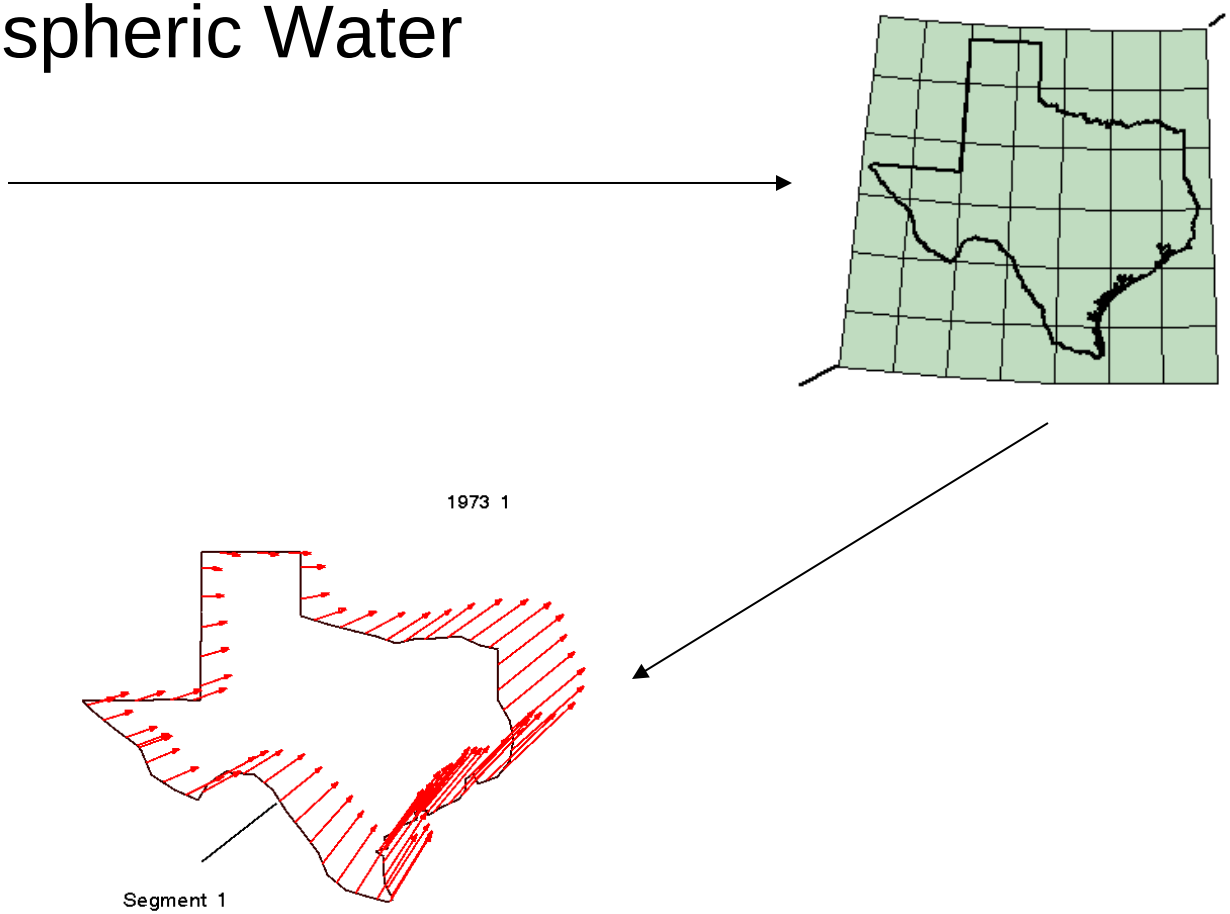


Compiling Watershed Attributes



DISCUSSION

- Atmospheric Water



Soil Water

- Soil water is that water contained within the soil column
- 1) soil moisture content to
- 2) evaporation,
- 3) precipitation, and
- 4) outflow from the soil.

Groundwater

- There are two kinds of groundwater flow: *unconfined flow* and *confined flow*
- In constructing a groundwater balance model, there are two computations to be performed:
- first, a water balance on each spatial unit
- second, a flow computation between each pair of spatial units

Surface Water

- Surface water is water in streams, lakes, wetlands and reservoirs

Discharge = From Flow + (Polygon Flow / L) * D

SUMMARY

- Many water balance methods - an atmospheric water balance, a soil-water balance, and a surface water balance - have been used in an attempt to gain an improved understanding of the stocks of water in different components of the hydrologic cycle and the fluxes between these components

CONCLUSIONS

- Three water balance methods
- an atmospheric water balance
- a soil-water balance
- a surface water balance
- an attempt to gain an improved understanding of the stocks of water in different components of the hydrologic cycle and the fluxes between these components.

RECOMMENDATIONS

- As spatial data sets from remote sensing
- A large amount of data for the state of region will be useful to others in the future.

QUESTIONS

- ?