

# **Using field exercises to develop critical thinking skills in hydrology students**

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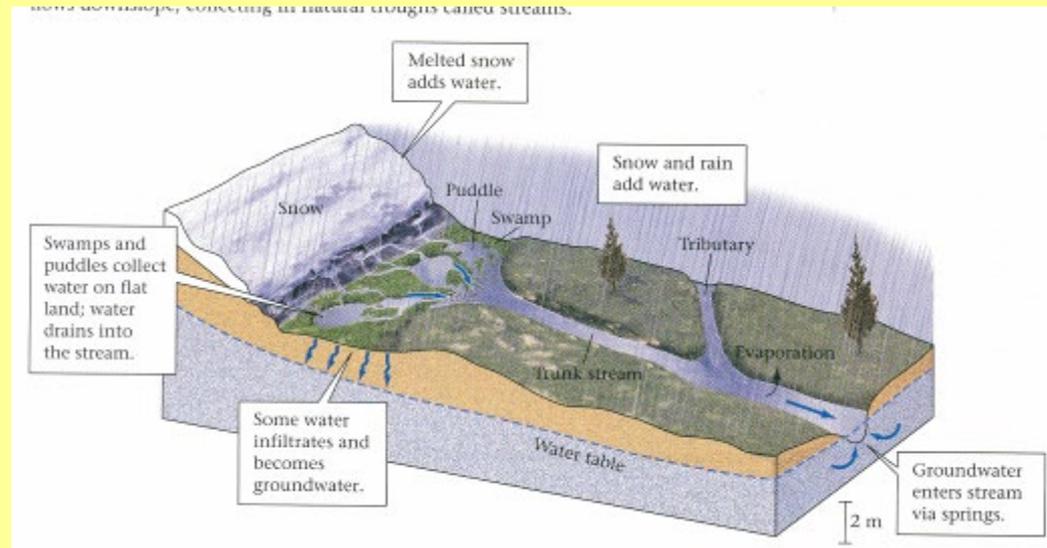
# Outline

- Description of the course – Hydrology
- Projects
  - Stream Discharge
  - Sediment Transport
- Outcomes



# Hydrology – Course Design

- Senior-Graduate Level Course
- Focus: Hydrologic Cycle – Surface Water
  - Precipitation
  - Infiltration
  - Surface Runoff
  - Stream Systems
- Format
  - Lecture
  - Problem Based
  - Field Work
- Spring semester course



# Field Work

- 2-3 Saturdays
- Begin once weather cooperates (Late Feb. early March)
- Field Work centered on two topics
  - Stream flow
  - Streambed sediment
- Concepts introduced in lecture
- Student Product: Assessment of sediment mobility in the stream.

# Project 1: Stream Flow



# Project 2: Streambed Sediment

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# Project Outcomes

## 1. Students learn methods and techniques



# Project Outcomes

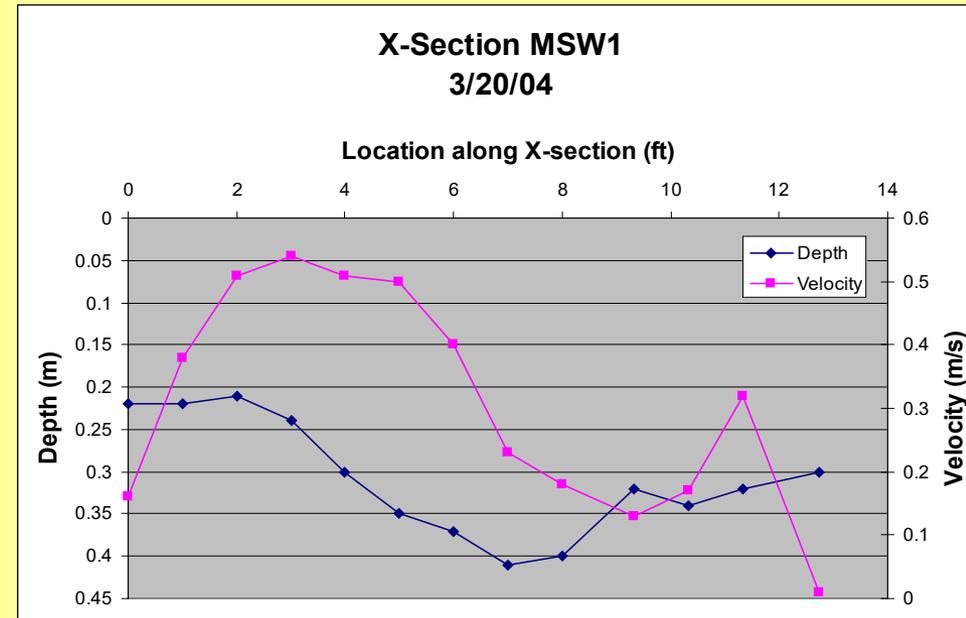
2. Students learn to work in groups in a field setting – making decisions as a team



# Project Outcomes

## 3. Data are incorporated into class assignments

- Data organization
- Discharge and stress calculations
- Sediment analysis
- Error evaluations
  - Are the data useable?
  - If not what can we do?
- Interpretation of individual data
  - Comparison of data from multiple locations-statistical evaluation
  - Analyze trends and assess the hydrologic situation



# Project Outcomes

## 4. Summarizing report

- Combination of stream flow and streambed sediment data
- Analyze and interpret combined data set



### Characterizing the Little Kickapoo Creek: An Analysis of Discharge and Sediment Transport

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**Abstract:** Three research groups gathered during Spring 2004 to evaluate a stretch of the Little Kickapoo Creek south of Bloomington, Illinois under assumed baseflow conditions with respect to the contribution of a large meander neck to the stream's discharge and competence. Discharge data indicates water is being lost somewhere between the upstream and the downstream sides of the meander neck. Also, the maximum grain size that could be moved by this stream under bankfull conditions is over 100 millimeters (large pebble- or cobble-sized particles). These data have significant implications for storm water management and urban development planning.

# Student Reaction

- Students enjoy the experience
- Students want to learn the field methods
- Students become involved in the project
- Students become more comfortable making interpretations about their data

# Acknowledgements

- I wish to thank CAT for funding the, Teaching-Learning Development Grant, “Advancing student learning of hydrology using field exercises.” Through the grant field equipment and supplies were purchased.
  - Velocity meter
  - Sediment samplers