

American Ground Water Trust
Ground Water Institute for Teachers™
Fort Collins, Colorado, July 2008

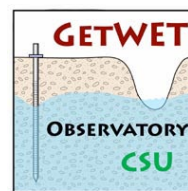


Wednesday July 30th 8:30am – 4:00pm
Thursday July 31st 8:30am – 4:00pm



CSMATE - Room B302 Natural & Environmental Sciences Building at CSU
GetWET Observatory field site
(Just south of the Hilton on Prospect Rd. in Fort Collins)

In Partnership with
Center for Science, Mathematics, and Technology Education
and the Department of Geosciences
Colorado State University, Fort Collins, Colorado



Contacts:

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CSU Dept. of Geosciences: Dr. Sara L. Rathburn, (970) 491-6956 [rathburn@cnr.colostate.edu]
CSMATE: Dr. Andrew Warnock, (970) 491-2845, [andrew.warnock@colostate.edu]
(1 CSU graduate continuing education credit is offered for \$72. Address all questions about graduate credit to Dr. Warnock)

Background: The Ground Water Institute for Teachers program is a content-focused training opportunity with applicability to many grades. The exciting and practical “science” of ground water can be applied to existing curriculum in many traditional subject areas. Over 50 Institutes have been completed in 17 states involving 1,200+ educators. The Trust’s national Institute program partner is the US Geological Survey. This will be the 5th American Ground Water Trust Institute to take place in Colorado.

The aim of the program is to increase water awareness of teachers, school students, citizens and communities so they may recognize the connected and integrated nature of the environment and be empowered to play an active role in protecting resources for sustainable use. Students made aware of “cause and effect” related to water resources and aquatic habitat are likely to become motivated to protect and conserve resources. Increasing the environmental awareness of citizens and communities is a vital need worldwide and specifically in Colorado because of the state’s finite resources and increasing environmental pressures.

Program Approach: This is a standards-based combined Earth science/science education course designed for 4-12 grade science teachers. Surface and groundwater content will focus on the portion of the water cycle where water is in contact with the ground. Key concepts will include a) watershed characteristics, b) distribution and movement of groundwater, c) relationship between surface and groundwater, and d) groundwater quantity and quality. These concepts will be explored through hands-on investigation, reading, discussion, and projects. Pedagogy includes the following strategies: inquiry methods, science content reading, writing, questioning, and cooperative learning. Participants will engage in reflection and development of individual and group projects aligned with Colorado science education standards and assessment frameworks, and use of technology in classroom application.

This Institute Program is also referenced as Colorado State University - NS696V Classroom and Field Strategies for Teaching Key Surface and Groundwater Concepts. Contact: Dr. Andrew Warnock, (970) 491-2845, andrew.warnock@colostate.edu.
Course website: <http://www.csmate.colostate.edu/getwet/>

Course Objectives:

1. To increase teachers’ knowledge of surface and groundwater concepts that can be applied to a school setting.
2. To increase teachers’ knowledge of inquiry and nature of science through authentic investigations and other activities.

3. To support teacher participants in improving instructional and professional practices, including:

- a) supporting learning by all students
- b) applying knowledge of alternative conceptions to teaching and learning
- c) using higher level questions to increase student understanding
- d) assessing student thinking and evaluating instructional tasks
- e) planning and communicating with other teacher participants
- f) participating in online discussions.

A significant portion of this course will take place in the field at the GetWET facility. Participants will collect data in separate groups, each focusing on different but related variables pertaining to the interaction of surface and groundwater.

Institute Program Wednesday, July 30, 2008

8:00 - 8:30 **PROGRAM SIGN-IN** at CSMATE
The Center for Science, Mathematics, and Technology Education CSMATE - Room B302
(Coffee & continental breakfast available)

8:30 - 8:45 **WELCOME AND INTRODUCTION TO THE INSTITUTE PROGRAM**
Dr. Stephen Thompson, CSMATE Director, Colorado State University, Fort Collins, CO
Andrew Warnock, Research Scientist, CSMATE, Colorado State University, Fort Collins, CO
Sara L. Rathburn, Professor, CSU Dept. of Geosciences, Colorado State University, Fort Collins, CO
Andrew Stone, Executive Director, American Ground Water Trust, Concord, NH

8:45 - 9:00 **COURSE OVERVIEW, PROGRAM OBJECTIVES AND GRADUATE CREDIT INFORMATION**
Andrew Warnock

9:30 - 9:50 **PREPARE FOR FIELD WORK**
Andrew Warnock and Sara Rathburn

- Description of site and variables we will study:

- 1) Water Table Elevations,
- 2) Dissolved Oxygen,
- 3) Electrical Conductivity,
- 4) Transparency & Color,
- 5) Soils & Sediments, and
- 6) Stream Velocity & Discharge.

- Break into teams based on interest and/or grade level

- Each group will focus on a different variable

9:50 - 10:00 **BREAK**

10:00 - 10:15 **VISIT CSU GREENHOUSE ENGINEERED WETLAND**
Sara Rathburn

- Factors involved in natural purification of water

[10:15 - 10:25 Drive to GetWET site]

10:25 - 11:45 **INQUIRY IN THE FIELD**
(All Staff)

- Practice collecting and recording data

- Identify natural and artificial features

- Identify potential sources of water contamination

[11:45 - 12:00 Return to CSMATE]

12:00 - 12:45 **LUNCH**

12:45 - 2:00 **THE HYDROLOGIC SYSTEM: BASICS OF HYDROLOGY AND ECONOMICS**
Andrew Stone

- Geology fundamentals (rock types/ geologic structure/ aquifer geometry)

- Concept of water balance (hydrologic accounting at local & regional scales)

- Perceptions of water as a shared resource

- Global & national economic realities of competing water demands
- Water quality concerns (arsenic, radon, perchlorate, pharmaceutical residuals, etc.)
- Mechanics and components of a groundwater well

2:00 – 2:15 **BREAK**

2:15 – 2:45 **INTRODUCTION OF READING ASSIGNMENT**

Andrew Warnock

- 1) Water and the Environment, Chapter 3
- 2) Water Towers, Pump Houses, and Mountain Streams
- 3) Students' Conceptions of Scale Regarding Groundwater"
- 4) Students' Ideas about Watersheds",
- 5) A Study of Junior High Students' Perceptions of the Water Cycle".

2:45 – 3:45 **THE GEOLOGY AND HYDROLOGIC CHARACTERISTICS OF COLORADO AQUIFERS**

Peter Barkmann, Hydrologist, Colorado Geological Survey, Denver, CO

- Geologic Setting of Colorado
- Major Classifications of Aquifer Types in Colorado
- Major Alluvial Aquifers
- Sedimentary Rock Aquifers
- Mountainous Region Aquifers

3:45 – 4:00 **END OF DAY ONE FEED-BACK**

Institute Program Thursday, July 31, 2008
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8:00 - 8:30 **PROGRAM SIGN-IN** at CSMATE
(Coffee & continental breakfast available)

8:30 - 9:00 **REFLECTION OF DAY 1 AND DISCUSSION OF ASSIGNED READINGS**
(All Staff)

9:00 - 10:00 **THE IMPORTANCE OF COLORADO GROUNDWATER IN OUR LIVES**

Bob Longenbaugh, (Former Assistant State Engineer and CSU Engineering Professor), Lakewood, CO

- Development of potable water supply for domestic consumption
- Water needs for Colorado's irrigated agriculture
- The need for conjunctive use of surface water and ground water to maximize supply availability
- Protection of resources from mining and other contamination sources

10:00 – 10:10 **BREAK**

[10:10 - -10:30 Drive to GetWET site]

10:30 - 11:45 **INQUIRY IN THE FIELD**

(All Staff)

- Swap field equipment
- Continue to measure and record data

[11:45-12:00 Return to CSMATE]

12:00-12:45 **LUNCH**

12:45-1:45 **DATA SHARING AND INTERPRETATION**

Andrew Warnock and Sara Rathburn

- Doing GIS with tracing paper
- Sorting and Graphing Data in Excel

1:45 - 2:30 **CONTAMINANTS OF EMERGING CONCERN: IS THERE A REASON TO GET EXCITED?**

Juliane Brown, *Research Hydrologist,, United States Geological Survey, Denver, CO*

- Endocrine disrupting compounds (EDCs) -- What are they?

- Observed effects of EDCs -- Signs of disruption in the environment
- Potential sources of EDCs -- Industrial, Agricultural and Municipal
- Case studies in Colorado and the Rocky Mountain region -- Occurrence in surface and ground waters

2:30 - 2:45 **BREAK**

2:45 – 3:30 **GROUNDWATER TOPICS AND THEIR CONNECTION TO SCIENCE TEACHING**

Andrew Stone

- The difference between groundwater renewability and sustainability
- Accessing ground water for economic use
- Hydrologically functioning homes and schools (Low impact development)
- Integration of climate change issues in teaching
- Perceptions and misperceptions of ground water in history
- The hydrologic cycle in poetry (Shakespeare's hydrology)

3:30 - 4:00 **INSTITUTE WIND DOWN**

(All Staff)

- Round-up of impressions
- Questions unanswered?
- Completion of evaluations

Post-workshop Assignment: (15 hours of work) (Required for award of graduate credit)

1. Post at least three messages to the CSMATE email listserv discussion (getwet4@csmate.colostate.edu).

The discussion will likely focus on water issues we come across on summer trips or that appear in the news.

2. Write a lesson plan that includes:

- a) a description of how you will adapt a classroom or field activity presented at this workshop for use in your school.
- b) a glossary of terms and facts that you will need to remember when it comes time to teach the lesson.
- c) a series of two or more test questions that will effectively assess whether or not your students learned from your lesson.

