**Alpine Hydrology Workshop Syllabus**

Saturday, March 14, 2015

8:00 AM to 5:00 PM

Durango Public Library, Durango

Instructors: Katya Hafich and Alice Hill

This workshop is designed for teachers and informal educators that teach grades 6-16. The workshop is made possible by the following partners; Mountain Studies Institute, CU Boulder Learn More About Climate, NSF-funded Dust On Snow grant (Award #1124576), CU Boulder Biological Sciences Initiative, and ScienceLIVE.

**Workshop Description**

What do El Niño, off-road vehicle use in the desert southwest, and alpine talus fields have in common? Join scientists from CU-Boulder to explore the connections between snow hydrology and the role of dust in nutrient cycling in the Colorado alpine. Learn how much water is stored in the snowpack, and where to find data on current and past snowfall. Build upon this understanding with a primer on the links between human activities and biogeochemical cycles, such as the nitrogen cycle, and how they affect the quality of the Colorado water supply.

**Learning Objectives**

By the end of this course, participants will be able to:

* Access, download, and analyze SNOTEL snow depth and discharge data.
* Define and calculate Snow Water Equivalent (SWE) from snowpit data, and comment on the spatial representativeness of point data to its surrounding area and to estimate the SWE stored in a watershed’s snowpack.
* Explain how the dust on snow problem effects the energy balance and snowmelt regimes with implications for water resource management.
* Describe how nitrogen undergoes cycling and transformations so that it can be usable to many different life forms, and explain how human actions are changing the nitrogen cycle by converting atmospheric nitrogen to more available forms in the cycle through fertilizer production and fossil fuel emissions.
* Have several concrete ideas for incorporating snow hydrology into the classroom.

**Lesson Plans Covered:**

**Snowpack and Discharge Data Access and Analysis**

(Data analysis is an emphasis of new NGSS standards)

A short training for teachers on how to access and download real time snowpack, hydrological, and climate data from the internet. The training also includes some ideas for data analysis to use in the classroom.

**Water storage in the Snowpack** (CO State Standards: Grade 6 ESS 3.2, HS ESS 3.6)

Students use real snow pit data from the San Juan Mountains to calculate snow water equivalent (SWE), which Colorado water managers monitor and assess daily. Students then use their knowledge of SWE and snow distribution to calculate how many peoples’ water needs can be met by an alpine valley snowpack.

**Alpine Nitrogen Cycle** (CO State Standards: Grade 6 LS 2.2, HS LS 2.1)

Students play the role of nitrogen atoms traveling through the nitrogen cycle in an alpine environment. This activity connects hydrology to alpine flora and fauna by showing how nutrients are cycled within high elevation environments.

**Lectures:**

**Mountain Studies Institute Hydrology Projects**

*Aaron Kimple, Mountain Studies Institute Program Director*

Wildfire, insects, and disease impact the landscapes ability to absorb precipitation. Aaron will discuss the connection between the health of up-land vegetation and hydrology in the wake of recent outbreaks and wildfire and present how one community group is approaching the problem.

**Snow Flow: A Problem-Based Learning Unit**

*J.D. Kurz, Pagosa Springs HS Science Teacher*

J.D. will share three interdisciplinary science units that focus on relevance and the application of high level skills to the problem based learning unit on snowmelt and discharge regimes in southwestern Colorado.

**Workshop Schedule**

8:00–8:30 Introduction and Welcome – Katya Hafich

Alpine Hydrology and Learn More About Climate Resources

8:30–9:00 Mountain Studies Institute Hydrology Programs – Aaron Kimple

9:00-9:45 Snow Flow: A Problem-Based Learning Unit – J.D. Kurz

9:45–10:00 Break

10:00-10:15 Snowpack and Discharge Data Analysis Introduction – Katya Hafich

10:15-12:00 Breakout Into Groups for Snowpack and Discharge Data Analysis Activity – Katya Hafich, Alice Hill, J.D. Kurz

12:00-1:00 Lunch

1:00-1:45 Interpolation Activity *(includes worksheet)* – Alice Hill

1:45-2:30 Water Storage in the Snowpack – Alice Hill

2:30-3:00 The Energy Balance, Modeling, & Dust on Snow – Alice Hill

3:00-3:15 Break

3:15-4:00 Alpine Nutrient Cycles – Katya Hafich

4:00-5:00 Alpine Nitrogen Cycle Activity – Katya Hafich