San Luis Valley Environmental and Conservation Education Council

Natural Resources Education Quarterly

Spring 2005, Volume 4, Issue 2

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Mission: Facilitate programs and services in environmental education for the people of the San Luis Valley

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Check It Out!

Zillions Of Field Trip Opportunities In The SLV

www.slv-ecec.org

More Than Just A Pretty View

By Mike Blakeman, Rio Grande National Forest

On a clear day, a person standing almost anywhere on the floor of the San Luis Valley can look towards the horizon and see mountains. We all love to look at these mountains (if we didn't, we'd move to Kansas, eh?), but our mountains are more than just a pretty view or a place to recreate. The mountains that surround the San Luis Valley provide us with most of the water we use every day. Whereas the floor of the San Luis Valley receives, on average, less than 10 inches of precipitation a year (water content), the mountains receive, on average, 20-50 inches a year.

Snows on Mount Blanca help provide the SLV with water

So far this year, our mountains have accumulated an excellent snowpack, with a 149-inch base being reported at the top of Wolf Creek Ski Area on March 1st—that's over 12 FEET of snow. As the snow begins to melt this spring, some of it will travel quickly down hill over the surface of the ground while some will sink into the soil and work its way down hill at a slower pace. So, in effect, the mountains are "shedding" the water off their flanks. This phenomenon gave rise to the term, "watershed." A watershed is commonly defined as a specific land area that drains water into a river system or other body of water. Watersheds come in many different sizes ranging from a small mountain drainage to the Rio Grande watershed, which drains several million acres within three states and Mexico.

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It's Almost Plantin' Time!

By Angie Graber, Agriculture Education

As the weather starts to warm up and spring approaches, farmers and ranchers throughout the San Luis Valley begin planning their activities on their agricultural lands for the year. They determine what and how much to plant based on several factors. These factors include how much snow pack is in the mountains, spring run-off, stream flows, ground water supplies, the condition of their soil, and whether its time to rotate a new crop onto the land.

Here in the San Luis Valley, agricultural lands are utilized for a variety of crops. Data gathered from the 2003 farming season reflected that potatoes were grown on almost 66,000 acres of farmland while another important crop to the area, alfalfa, was planted on approximately 130,000 acres. Other types of hay were recorded at 100,000 acres. Winter and spring wheat took up 14,000 acres and barley was planted on approximately 52,500 acres.

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More Than Just A Pretty View *(Continued from page 1)*

"I take nothing for granted. I now only have good days or great days."

- Lance Armstrong

Typically, small watersheds combine to form larger watersheds, which combine to form even larger watersheds, which combine… until a size is reached that drains into the ocean or a closed basin with no outlet. The San Luis Valley contains both types of watersheds: watersheds that eventually drain into the Gulf of Mexico via the Rio Grande, and ones that drain into a closed basin located in the northen half of the Valley.

Understanding the watershed concept is important because what happens within the watershed can have profound effects on plants, animals, and people. For example, the loss of trees over large areas on the mountains will actually increase the amount of water being shed into the drainage. This is because trees act like straws sucking up water with their roots and releasing it into the atmosphere through a process called transpiration. So, clearing trees from large areas sounds like a good thing, but as some homeowners in the South Fork area found out after the Million Fire, it's not quite that simple. The loss of forest and ground cover due to the fire above South Fork led to increased erosion, decreased water quality, and increased risk of flooding.

Another important watershed concept is that a finite amount of water falls on a watershed, thus there is only a finite amount of surface water available for use by plants, animals, and humans. Water is lost from a watershed through outflow (e.g., a river), evaporation, transpiration, and sublimation. Humans have minimal influence on water loss through sublimation, which occurs when snow changes directly into water vapor (without melting first) and moves into the atmosphere. But, we can greatly affect water loss from evaporation and transpiration through our personal consumption and use in agriculture.

Watersheds may also act like tool sheds. Just as tool sheds are places to store tools, watersheds may contain areas that store water. The San Luis Valley is blessed with a large aquifer that stores a huge quantity of water. This is a good thing, because since the very dry year of 2000, water losses from the San Luis Valley have greatly exceeded water input and we have been heavily dependent on our stored water. This has been painfully evident to some homeowners and farmers as their wells have gone dry due to the drop in our water table.

It should now be quite obvious that studying and understanding watersheds is of great importance. Without a clear understanding of how watersheds work and how humans affect them, we could find ourselves in a very difficult situation. It should also be quite clear that our snow covered mountains are more than just a pretty view.

Check Out These Links And Resources

Science in Your Watershed: This site uses a mapping tool to allow students to zoom into the specific watershed they live in.
http://water.usgs.gov/wsc/map_index.html

Based in Missouri, this site provides excellent general information about watersheds.
http://www.cares.missouri.edu/dardenne/WshedEd.htm

To see the details about past and current weather conditions at the Great Sand Dunes National Park and Preserve, go to:
http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?coCSDU

Discover a Watershed: Rio Grande/Rio Bravo. This is a great educator's guide about the Rio Grande watershed that includes activities and content information covering the entire length of the Rio Grande. Cost is about $20. Order it from:
The Watercourse
201 Culbertson Hall
Montana State University
Bozeman, Montana 59717-0570
Phone: 886-337-5486
Email: Watercourse@montana.edu

SLV Success Stories Essay Contest

Attention San Luis Valley classes! Is your class or school doing something that helps the environment? The San Luis Valley Earth Day group would like to hear from you. They are offering the chance to win a pizza party for your class and public recognition at this year's Earth Day Festival on April 23rd at Cole Park.

To enter:
Write a 1-2 page essay about your project and include at least one picture. In your essay, be sure to detail: what the project is, how your class (or school) came up with the idea, how (specifically) it helps the environment, and why you think it is important. Essays should be written by a student or team of students. Drop your entry by the Valley Community Fund office at 707 Main Street in Alamosa or, send it to:

Attn: Success Stories
Valley Community Fund
P.O. Box 1093
Alamosa CO 81101

Entries are due by April 8th. If you have any questions about this contest, contact Nancy Molina at (719)589-5688 or nancyvcf@amigo.net.

Calendar of Events

April 14th SLV Service Learning Youth Summit, Alamosa Boys and Girls Club 8:30-2:30. Nancy Molina: 589-5688

April 23rd San Luis Valley Earth Day Celebration, Cole Park

April 29-May 1 Teaching Outside the Box: Creative Use of Nature in Education. More info at: http://www.caee.org

July 5-10th Colorado State Forest Service Fire Ecology Institute, Glenwood Springs

Fire Ecology Workshop

The Colorado State Forest Service is pleased to announce that they are able to offer to educators the popular summer Fire Ecology Institute at no cost to participants, thanks to a national fire plan grant.

This week long intensive session will be held at Colorado Mt. College in Glenwood Springs from July 5-10, 2005. It is open to all 4th-12th grade educators. Participants are expected to report back within one year about their use of the educational materials and content provided.

Topics include fire ecology of the Ponderosa, Lodge pole and Limber pine forests and grasslands; fire effects on wildlife, soils, water, air, people; fire, behavior, history, suppression, mitigation and use (prescribed fire); teaching literacy with fire, teaching inquiry science with fire experiments, and general mapping skills with an introduction to GIS. An optional 2.5 semester credits are available from either Colorado School of Mines or Colorado State University.

For more information or to register, contact Shawna Crocker, 303-202-4662, scrocker@lamar.colostate.edu.

It's Almost Plantin' Time *(Continued from page 1)*

The crops that are grown here in the San Luis Valley require different amounts of water to grow. For instance, potatoes require about 16 inches of water throughout the growing season. Small grains such as barley and wheat require more water than potatoes, averaging about 20 inches. Alfalfa is the biggest water user, requiring about 30 inches of water when fully irrigated, which in turn yields three cuttings throughout the growing season. In addition, ranchers need about 12 inches of water to maintain a pasture with limited irrigation for their livestock.

Farming and ranching in the San Luis Valley requires a great deal of knowledge, experience, and a passion for the land. This spring, consider taking your class to a farm or a ranch to learn first-hand about food production in the San Luis Valley.

To learn more about agriculture in the San Luis Valley visit Agricultural Research Services at www.ars.usda.gov or the Natural Resources Conservation Service at www.nrcs.usda.gov

Kids In Action!

By Nicole Langley, EarthNest

22 Fifth-graders helped plant 130 trees last Arbor Day. This year they returned as sixth graders to see how the baby trees weathered their first winter at EarthNest.

Graduate Intern Ashley Pryor explains crypto-micro-organisms and off-road 4-wheelers to Sierra Grande 5th grade.

The JUNIPER CREW from Alamosa Boys & Girls Club.

Surge Flow!

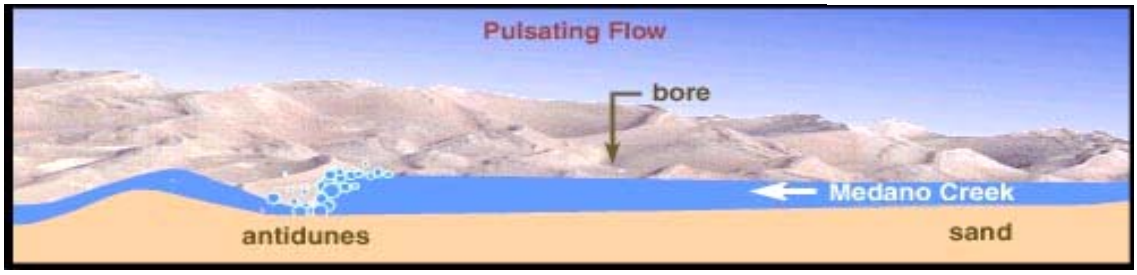
By Kathy Zelenka, Great Sand Dunes National Park and Preserve

We all know that water is vitally important to all life. At Great Sand Dunes National Park and Preserve, two very special creeks flow seasonally on either side of the dunefield, providing water for hundreds of species of plants and animals. Not only do the creeks help support a great diversity of life, but they also exhibit a globally rare hydrologic phenomenon called "surge flow".

If you've spent a spring or early summer day near Medano Creek, you'll likely recall the rhythmically pulsating waves that flow down the creek every 15-20 seconds. These surges are made possible by the happy coincidence of three factors: a steep enough grade to give the stream a relatively high velocity; a smooth, sandy surface with little resistance; and sufficient water flow. Medano Creek possesses these three characteristics in abundance.

As rivulets of melting snow join Medano Creek and flow along the sandy streambed near the dunes, underwater dunes (called "antidunes") are created. The water carries sand grains from trough to crest in the same way that wind action creates sand ripples on dry land. As the height of the antidune increases, the volume of water dammed behind it eventually exerts enough pressure to break the antidune and spill over into the next trough downstream. A chain reaction, similar to a line of tipped dominos, takes place and a bore of water surges downstream. Subsequent bores occur as antidunes rebuild and break once again.

In wet years, waves can surge up to a foot high! To date, snowpack in Medano Creek's watershed is about 147% of normal, so it seems that creekflow will be abundant. If you visit the Dunes this spring or early summer, take a minute to watch or play in those intriguing surges on Medano Creek!



(Modified from D. Bean, *Pulsating Flow*, 1977)

Learn more about Medano Creek's fascinating wave action with articles and animations. Check out this link to Great Sand Dunes National Park and Preserve's website section on hydrology.
http://www.nps.gov/grsa/resources/hydrology.htm

EE Contacts

Geology, Ecosystems, Cultures & Archaeology	Great Sand Dunes National Park and Preserve. . . Kathy Zelenka. . . 719-378-6344 Kathy_Zelenka@nps.gov
Wetland Ecosystems and Wildlife	Alamosa, Baca, Monte Vista National Wildlife Refuges . . . 589-4021
Water and Soil Conservation	SLV Conservation Districts & NRCS . . . Angie Graber. . . 589-3907 X117 angie.graber@co.usda.gov
Service Learning	Volunteer Connections. . . . . 719-589-5688. . .vcf@amigo.net
Sustainable Development and Culture	EarthNest Institute. . . . . Nicole V. Langley. . . 719-206-2222 nlangley@fone.net
Natural Resource Conservation Camp at Beaver Creek	Colorado State University Extension Service. . . Robert Mathis. . .657-0213 rmathis@coop.ext.colostate.edu
Forest, Range and River Ecosystems	Rio Grande National Forest . . . Mike Blakeman . . .852-6212. . . mblakeman@fs.fed.us Colorado State Forest Service. . . Boyd Lebeda
Other Resources	SLV Resource Conservation and Development. . . Jim Mietz james.mietz@co.usda.gov

An Ocean in Colorado?

LEARNER OUTCOMES: Students will understand the globally rare phenomenon of surge flow, exhibited in Medano Creek. Students will conduct an experiment by measuring, recording, and graphing data about stream flow. Students will compare the waves of an ocean on the beach to the surges of water in Medano Creek. They will also use measuring skills to compare the pulses of water.

GRADES: 3rd-5th, adaptable for older and younger students

STATE STANDARDS: Geography 3.1; Math 1 - 3, 5, 6; Science 1, 2.1 - 2.3, 4.3, 6

TIME: 45 minutes

LOCATION: Great Sand Dunes National Park and Preserve, alongside Medano Creek

MATERIALS: Stop watches, clipboards, paper, pencil, colored pencils, yardsticks, Surge Flow Graphing Worksheet

SAFETY CONSIDERATION: Do not leave shoes, backpacks, or valuables close to the creek, for it frequently shifts and swells.

BACKGROUND: Medano Creek exhibits a unique phenomenon, in that it flows in periodic surges like ocean waves coming onto the beach. For surge flow (also known as pulsating flow) to occur, three conditions must be met: swift water velocity, shallow water depth, and a sandy streambed. Medano Creek meets all three criteria, as does Sand Creek on the other side of the dunefield. Medano Creek has a steep slope, as streams go, and as a result, the stream has a high velocity. It is also shallow and flows over a bed of almost pure sand. As the water flows, ridges and troughs of sand form on the floor of the creek. The troughs, known as antidunes, act as tiny dams holding the water back until the flow breaks over the top, causing a "surge." New antidunes continually form and break

Surge size and frequency depend on how much water is flowing in Medano Creek. In the spring and early summer, the average frequency occurs approximately every 15 seconds. The students will test to see if the surges really do come every 15 seconds.

In normal precipitation years, these experiments are best conducted during spring and early summer, when Medano Creek is flowing. This is a seasonal creek that typically stops flowing past the main dunes access area from midsummer through early spring. Call the Visitor Center (719) 378-6399 for current conditions. Note that in the morning, water temperatures can be quite chilly. Plan this activity for late morning or afternoon, if possible.

PROCEDURE:

Prior to the field trip, have students view the Pulsating Flow animation and read about Medano Creek on Great Sand Dunes' website. (http://www.nps.gov/grsa/resources/hydrology.htm)

Before beginning the experiments, question students about what they learned about Medano Creek, such as where the water comes from, where it goes, and that it exhibits the rare phenomenon of surge flow. Point out that the waves are formed by the tiny sand dams, or antidunes, on the stream bed. Have students locate some antidunes. Watch the water pool and then the surge.

For the following hydrology experiments, print out one copy of the Surge Flow Graphing Worksheet for each group.

Experiment 1 - Surge Frequency

Describe the purpose of the first experiment to students: to measure how often the surges happen on Medano Creek. As a class, spend a few minutes considering and discussing possible methods and procedures for conducting this experiment.

An Ocean In Colorado? (Continued from previous page)

After experiment ideas have been discussed, divide the class into groups of four students each. Give each group a stopwatch and a worksheet. Space groups along the creek, with each group about 30 feet apart (so they are out of immediate earshot of one another.) Have each group decide how to measure surge frequency and write out their procedure. Each member of the group should practice timing a surge and recording the result. Have the groups average the results of the four measurements. Gather back as a class and compare results. Did measurements differ in places where the creek is deeper or shallower? Why or why not? If there was a difference, describe it.

Experiment 2 - Antidune Development

The groups will now measure how much the water around an antidune changes during the surges. Give each student an assignment: one student will record data, the second will manage the stopwatch, the third will take measurements (on the upstream side of the antidune), and the fourth will observe the antidune development in the area of measurement.

Demonstrate how to conduct the experiment, placing a yardstick on the upstream side of the antidune in such a way that measurements are consistent. Measurers will read the depth of the water at their location every five seconds. Remind them to be sure that the bottom of the yard stick does not become buried by new sand. If it does the yard stick will need to be repositioned. The student with the stopwatch will call out "time" when it is time for students to take a reading. The Measurer will call out the reading, which will be written down by the Recorder. Timers should also call out to the Recorder the time when a surge breaks. Recorders will place a special mark on the graph when a surge breaks on the yard stick. Continue measuring and recording for 60 seconds.

Repeat up to four times at the same location, recording data with different colored pencil on the same graph at the same location.

After the activity, have the students discuss the results. Was there any consistency in the difference in water levels just before the antidune broke? Discuss the antidune's role in helping to create the surge flow phenomena. Discuss what might happen if there was no sand at the base of the dunes. How would this affect Medano Creek?

CRITICAL THINKING QUESTION: Has anyone ever been to a beach by an ocean or lake? How are the waves and surrounding environment similar and/or different from what students are seeing along Medano Creek?

Surge Flow Graphing

Measuring, Recording, and Anaylizing

Researcher Names: _____

Date and Time: _____

Surge Frequency

Reach Description: _____

_____

_____

_____

_____

_____

_____

1st Surge 0 seconds

2nd Surge ____ seconds

3rd Surge ____ seconds

4th Surge + ____ seconds

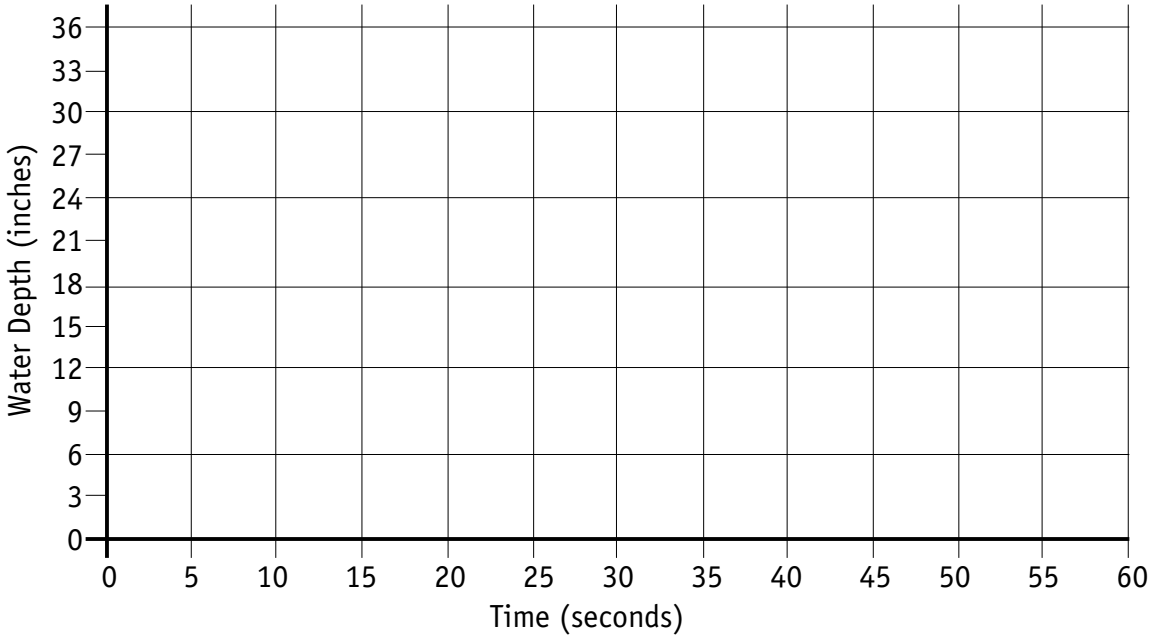
Total ____

÷ 4

Average Surge _____

Describe your section of reach thoroughly above. How wide is it? How deep is the water? Are there log jams or rocks? Is the water flowing fast or slow?

Antidune Development



Choose a location to measure antidune development where surges are occurring and where the water depth is less than 36 inches deep. Begin by placing the yardstick in the trough of an antidune. Begin measuring at the moment a surge hits your stick. This measurement will be graphed at 0 zeconds. Continue measuring the depth every five seconds for one minute.