GEMS NET Land and Water 4th Grader Workshops in Cooperation with Save the Bay

Background Knowledge: **(In most cases, background knowledge has been built through use of a science kit in the classroom and/or a prior visit by AYERS foundation to the classroom and/or a visit to one of Save the Bay's Learning Centers)**

Objective and Learning Standard:

The objective of these workshops is to use real world settings and practical application to reinforce the classroom work undertaken and theories taught by schoolteachers working with the Land and Water GEMS NET kit. The following learning standards that may be investigated are:

1. ESS1 (K-4) INQ 2 – use results from an experiment to draw conclusions about how water interacts with earth materials (percolation, erosion, deposition, etc.) and
2. ESS1 (K-4) INQ 4 – explain how wind, water, or ice shape and reshape the earth.
3. ESS1 (K-4) INQ-1 Given certain earth materials (soils, rocks, or minerals) use physical properties to sort, classify and describe them.
4. ESS1 (K-4) FAF -6 Given information about earth materials explain how their characteristics lend themselves to specific uses

Glossary of Terms:

(This list of terms contains vocabulary words that could be applicable to and used in the workshop(s), however all of them may not be incorporated into the activities)

Geology -
Tributary –
Soil Composition -
Sand -
Silt -
Clay -
Channel -
Riparian -
Floodplain -
Wetland -
Brackish -
Sediment -
Sedimentation –
Percolation –
Infiltration –
Sustainability-

Deposition -
Erosion –
Fertility -
Slope –
Dunes –
Cover crop –
Salt pond –
Sea wall –
Marsh –
Climate change –
Velocity-

POSSIBLE LAND and WATER WORKSHOPS (a' la carte):
[Note: the activities listed below can be tailored to the classroom teacher's goals and plans. We will work with the teacher to ensure that our program(s) meet expectations and are customized to best enhance the learning of that teacher's particular students; all programs are flexible.]

[Note: We try to carry out program activities in smaller groups – and within those groups, teams - of students in order to maximize quality and depth of learning experiences.]

WORKSHOP 1

Determining the Health of Water

Objective: to reinforce the theories and classroom work of the Land and Water GEMS NET kit by facilitating activities in which students determine:

a. The health of a stream(s) in our local community.
b. Contributing factors that may impact the stream(s)' health.
c. Possible solutions to the problem of unhealthy stream and erosion from water.

Introduction: Explain the learning objectives and generally introduce the site

Possible Guiding Questions and Concepts:
(Numerous activities can be created surrounding 1 or more question(s) to activate prior/background knowledge):

- What is a tributary? Why is it important?
- What is a riparian area? Why is it important?
- Constrained channels in comparison to unconstrained ones? Define. The effects on flow of water and shaping of land over time?
- What soil components (sand, silt, clay, etc.) do you think exist here?
- What form and shape does this stream have? Why?
- What determines the size of stream and volume of water in it?

- Discuss what determines water velocity (speed) of stream – width, depth, slope, and stream bottoms (mud, rock, etc.)
- What is a floodplain? Is there one here?
- What is a wetland? Could we define the wetland (or bottomland) here?
- Is there a difference between a flood plain and wetland?
- What impact might humans (farmers, foresters, ranchers, etc.) have on riparian areas or wetlands?
- What are sediments? How or why are they dislodged or moved, transported, and deposited?

Possible Activity– Determining of the health of a stream:

Break up students into teams of 3 and fill buckets of water from stream. Use dip nets to detect presence of wildlife. Scan area immediately over stream channel for insects. Each team could have one or more specific focus (i.e. record the wildlife you find, describe the water - smell, color, clarity). After teams record their findings, AYERSfoundation team member could facilitate discussion on findings.

- Sediment?
- Silt?
- Color?
- Smell?
- Wildlife?

What could these findings suggest? Do they tell us anything about the health of the water? (Leading into concept of Water Runoff-based Erosion)

Possible Follow-up Activity– Determining of the health of a stream:

Now, the teams fill their buckets of water and pour them over the stream bank. Team members must watch carefully and document what is happening as they pour the water over the stream bank. The teams could also do this activity a couple of times, pouring the water at different speed to notice the differences in outcomes with a slow pour vs. a water dump. Teams document what is happening in each case and share their results. After teams record their findings, AYERSfoundation team member could facilitate discussion on findings.

What could these findings suggest? Do they tell us anything about what impacts the health of the water? Why? What could be important about the velocity of water (Leading into concept of Bank Erosion)?

Possible Follow-up Activity-Determining the Health of a Stream
Stream bank Erosion

Teams find a bend in the stream (ultimately there are a few bends nearby so that some teams are at one and some are at other bends) – Teams can identify where the water is digging out the stream bank (these streams are called meandering streams) and describe and document the characteristics of the dug out stream bank. Teams share findings. Then teams determine what could happen to the stream bank and stream bank ecology (things, organism, etc. that could be on the stream bank) over time.
Teams share thoughts. (The conversation could lead into the concept of stream bank erosion and how humans may impact the rate at which this natural phenomenon occurs.

Debrief

Discuss and interpret findings from the day's activities–
What can we do about this? (problem solving)
Teams develop a few possible solutions to any/some/all of their findings and implications of their findings.
Share plans and discuss what plans/solutions could help the problem(s) of different forms of erosion.

WORKSHOP 2

Determining the Health of Local Soil

Objective: to reinforce the theories and classroom work of the Land and Water GEMS NET kit by facilitating activities in which students determine:

a. the health of soil in our area.
b. soil characteristics that may lead to erosion, good fertile farming, dry conditions, flooding.
c. possible solutions to the problem(s) of unhealthy soil and erosion

Introduction: Explain the learning objectives and generally introduce the site

Possible Guiding Questions and Concepts:
(Numerous activities can be created surrounding 1 or more question(s) to activate prior/background knowledge):

- Examine composition of soil – what components make up this soil (sand, silt, clay, humus)? Is garden soil coarse, fine, or in between?
- What color is garden soil? Can we relate color of soil to its composition (what it's made of)?
- What is erosion?
- Is this site prone to erosion? Why or why not?
- Do we see any examples of erosion in the garden?
- What causes erosion?
- What are the effects (or costs) of erosion?
- What can people (farmers, ranchers, foresters, et. al.) do to reduce or minimize erosion?
- What role do plants play in building soil and conserving it?

Possible Activity - determining the soil composition of 2 or more soil samples from different local geological sites by observations & touch, and deciding how each soil's make-up may contribute to the soil's health and fertility:

Break students into teams of 2 or 3 or 4 and record characteristics of 2 or more samples of soil. Teams will feel and manipulate soils between the fingers to determine composition and characteristics of soil. Different soil sample may include:

- Clay
- Silt
- Sand
- Humus (organic matter)
- Gravel

Share findings. Discuss what may contribute to the health and fertility of the soil (i.e. which types of soil(s) might be best for farming? Why?)

Possible Activity 2 – identifying signs of erosion, unhealthy soil across a field or garden.

Teams go out onto a field or garden and find and record evidence of unhealthy soil or soil conditions. Share findings. Discuss what might contribute to a given situation (cause and effect).

Debrief

Discuss and interpret findings from the day's activities–
What can we do about this? (Problem solving)

Teams develop a few possible solutions to any/some/all of their findings and implications of their findings.
Share plans and discuss what plans/solutions could help the problem(s) of erosion. Discuss possible solutions in the context of geology, erosion potential, fertility, and percolation (or water infiltration),land use history and management of soil.

WORKSHOP 3*: Determining the health of the local seashore*
Objective: to reinforce the theories and classroom work of the Land and Water GEMS NET kit by facilitating activities in which students:

a. distinguish elements of our local beaches
b. determine the roles each element (dunes, sand, water, waves, etc.) has in contributing to a healthy shoreline ecosystem
c. evaluate the impact of changing weather conditions on each of those elements.

Introduction: Explain the learning objectives and generally introduce the site

Possible Guiding Questions and Concepts:
(Numerous activities can be created surrounding 1 or more question(s) to activate prior/background knowledge):

- Examine setting of seashore and discuss what we see
- What makes-up the beach (sand, water, grasses, shrubs, trees…)?
- Is this site a natural setting or a human-controlled one?
- What recently happened here?
- Are there weather trends that are impacting the seashore?
- Discuss the interaction between sand, water, and wind during major storm events? And over long periods of time (decades)?
- Is the beach in a state of constant change?
- Where does the sand go and where does it come from?
- Does the beach appear to have taken on a new shape or form?
- What role do the dunes play?
- What are models?
- Why do we use models?
- How can we use models for predicting the future of weather events and their effects on the beach and seashore community?
- Is good science important in building models?
- Are models fail-safe even if we use good science (completely reliable)?

Possible Activity 1- deciding what is evidence of erosion on the beach

Students work in small teams/pairs to think and share what an unhealthy beach would look like. What would be found on it? What might the shore look like? Share with the larger group and come up with some ideas/list of evidence of an unhealthy beach, eroded beach.

Possible Activity 2 - Evaluating how the dynamic nature of the seashore (and its interacting phenomena) is being affected by climate change

Beach Scavenger Hunt

In pairs or groups of 3, find indicators of weather events and write them down (perhaps the list/ideas shared in activity 1 could be helpful). Each group shares findings with everyone. What causes these artifacts/evidence? Why do you think this natural process (or condition) is happening or appearing more often? Lead into conversation about: what effect(s) could these intense more frequent weather occurrences have on human development and native species, your neighborhood?

Possible Activity 3 – determining how we humans best adapt to change and evaluate the tools we use

In this activity, students describe ways in which people deal with climate change, what they do, how they do it, and the tools they use. There are numerous options here (as in most activities) like working in pairs, teams, writing, drawing ways humans adapt. Students can determine which tools are helpful, which add to the problem and other possible solutions to any of these scenarios. Share the responses.

Possible Activity 4- predicting the future of the beach and shoreline environments

Under the assumptions that storms, due to climate change, will become more frequent and more severe during the 21st century, students can predict in journals what will happen to the beach and the seashore environment (dunes, pond, marshes, native species, etc.) over the next 50 years? Should we base planning decisions on our predictions? Why or why not? Share some predictions.

Debrief
Discuss and interpret the day's activities-
What are the problems for the shoreline? Contributing factors? Real evidence? And what do we do about it? Are there better ways in which to handle the possibilities and predicts of the future?

Possible Other Sites for workshops on Land and Water:
Salt Pond
Multiple local soil sample sites
Multiple local streams sites for water sampling

ASSESSMENT PLANS
In all cases, it would be ideal for The AyersFoundation to work with the teacher and develop a pre and post workshop assessment. This helps us determine the value added and gauge the success of the work. This kind of information aids us in continuing to improve and evolve our programs for the greatest positive impact on students' retention of knowledge and achievements.

[NOTE: A possible Research/Lab Workshop could be developed around the following activities:
(4th grade math standards could be included for these activities)

Using different types of soil, students create erosion models
What happens to rain when it hits the ground? With soil pressed into a tray, etc., simulate rain with a sprinkling can or a spray bottle or some instrument that would simulate heavy rain. Use a measured amount of water and then catch and measure the runoff. How much runs off? About what fraction is that? What happens to the rest of the water? Is there a difference in the amount of runoff based on type of rain (sprinkle, medium and downpour)? Related activity would be to use different types of soil and compare results. A table could be created with the data. Why is this important to a farmer?

What happens to the soil when it rains, pours? Do activity similar to above but instead of measuring the runoff, let it settle and compare sediments with different types of rain (sprinkle, medium, downpour) or different types of soil, or different slopes. These are a lot of variables, so it may not be possible to do them all. Again, a data table could be created for each variable.... How is this important to farming? It might be important to at least make the point that wind also impacts erosion.]