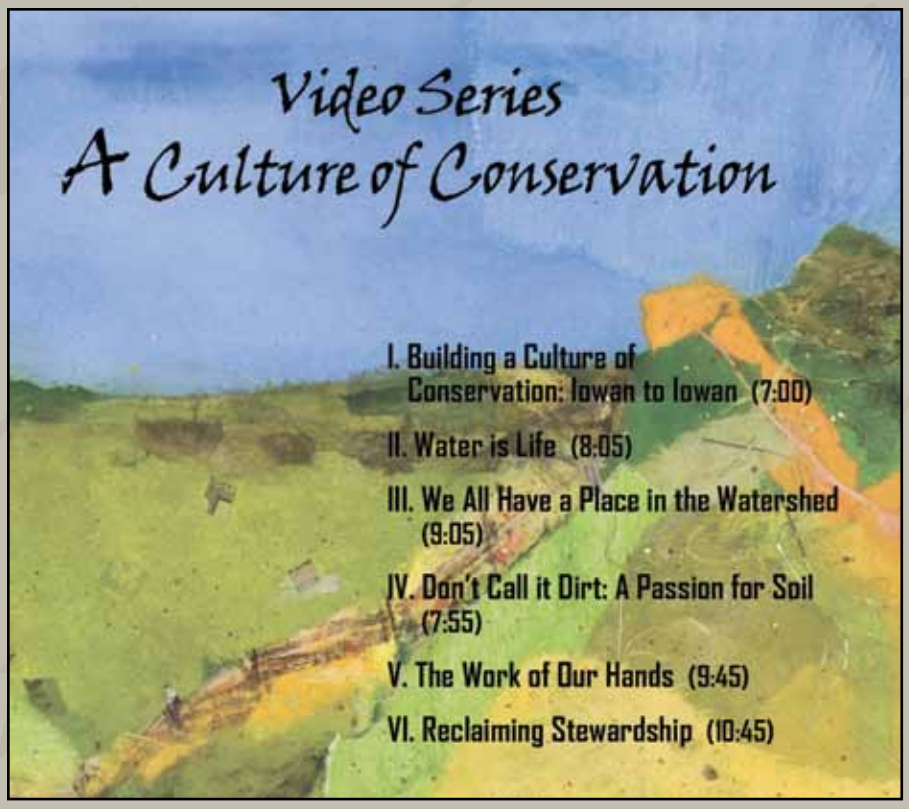
Building a Culture of Conservation – It All Begins with You!

Enhancement activities for 6-9th grade students to accompany the video series "A Culture of Conservation"

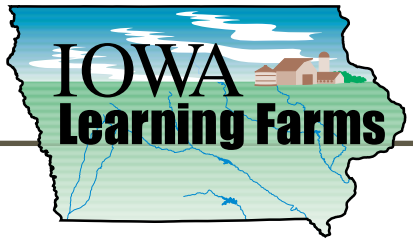


Iowa Learning Farms

Iowa Learning Farms, initiated in 2005, is a unique partnership of farmers, state and federal agencies, conservation groups, the research community and the general public.
Iowa Learning Farms is building a Culture of Conservation, taking a grassroots approach to develop innovative ways in which all Iowans have an active role in keeping our natural resources healthy.

For more information about the Iowa Learning Farms, visit our web site:
www.extension.iastate.edu/ilf
Check the web site periodically for additional resource information.

The Culture of Conservation video series was developed for the Soil and Water Conservation Districts of Iowa and is based on ideas expressed by farmers, resource staff and other Iowans during listening sessions conducted across the state by Iowa Learning Farms in 2008.



Enhancement activities for 6-9th grades compiled by Mary Swalla Holmes.
Enhancement activities for High school/junior college compiled by Karla Stevens.

9/2010

Building a Culture of Conservation – It All Begins with You!

Enhancement Activities for 6-9th Grade Students

This five-part enhancement activity links the social concepts of Connection, Reciprocity, Responsibility, Resilience, and Respect to the interacting environmental systems that support all life on earth.

This video series and curriculum enhancement is rooted specifically in Iowa, emphasizing the near environment. Students will begin to understand how their decisions and behaviors impact the world around them.

Activities begin with a 7-10 minute video and include:

Fieldwork exercises: students learn the important skill of observation and other skills to research environmental issues,

Issue-oriented classroom activities: students are required to think critically about environmental problems and link appropriate social behaviors.

The videos in this series explore the importance, the history and the relationships we have with soil and water. These activities further develop the themes of the videos and deepen the learning experience for your students.

Video I.	Building a Culture of Conservation: Iowan to Iowan (7:00) – Overview
Video II.	Water is Life (8:05) – Connection & Water Cycle
Video III.	We All Have a Place in the Watershed (9:05) – Responsibility
Video IV.	Don't Call it Dirt: A Passion for Soil (7:55) – Respect & Soil System
Video V.	The Work of Our Hands (9:45) – Resilience, Diversity & Flexibility
Video VI.	Reclaiming Stewardship (10:45) – Reciprocity & Conservation Practices

Video II. Water is Life

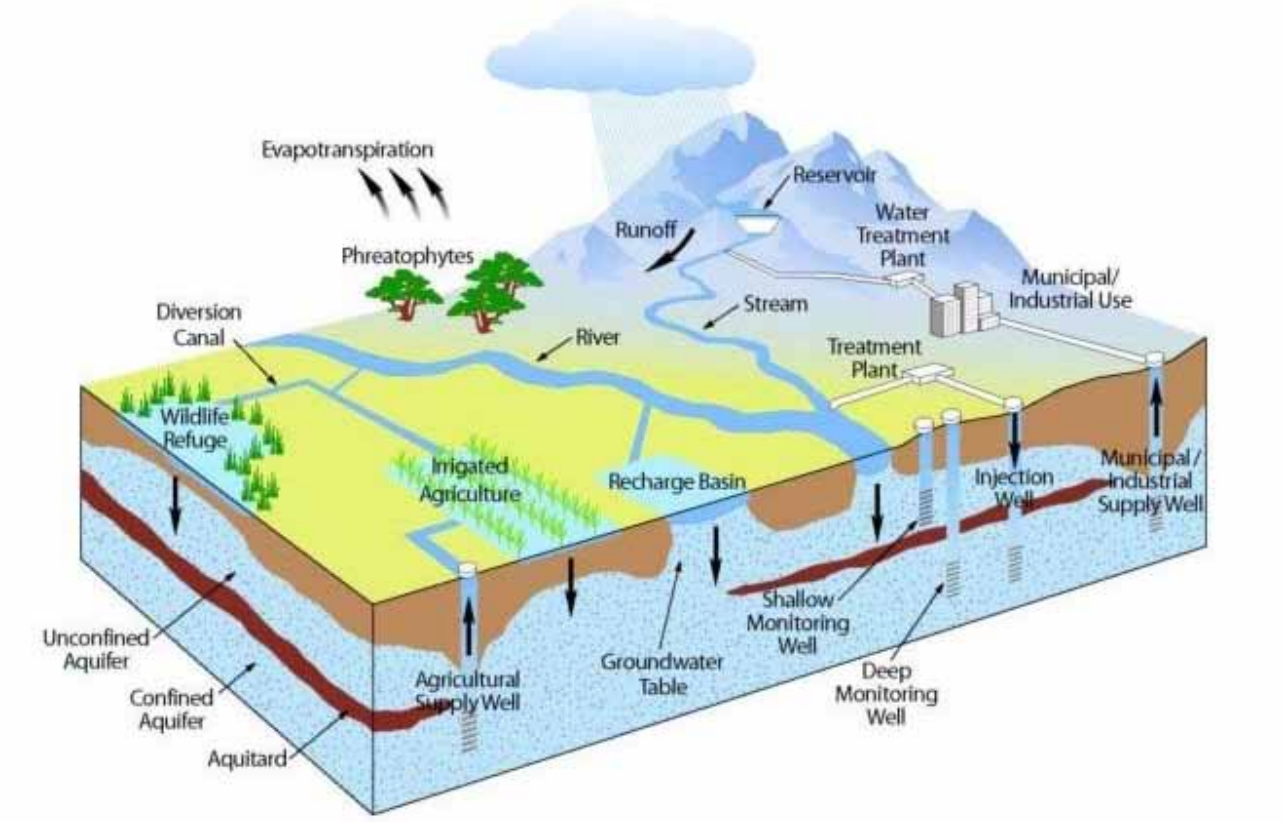
TOPIC: Water Cycle

Concepts

- Evaporation and Transpiration
- Condensation
- Precipitation
- Runoff and Groundwater

Understandings

- Student will understand the components of the water cycle and how they interact
- Student will understand their place/role in the water cycle
- Student will begin to define their own responsibility toward water



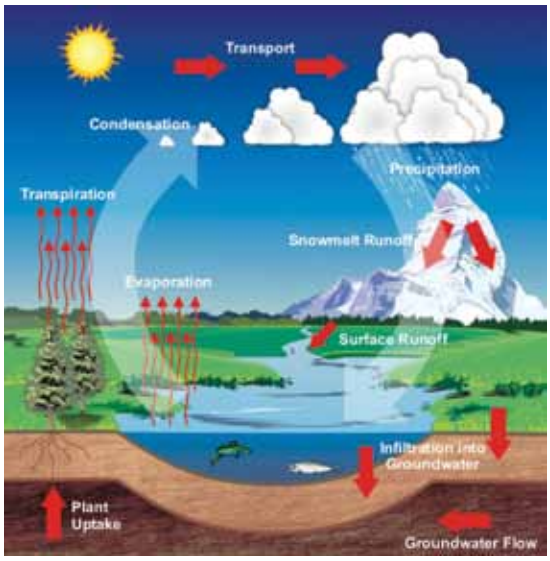
Graphic of the hydrological cycle (the science) is from Iowa State Department of Natural Resources Ecology and Management.

The Water Cycle

From the National Weather Service Forecast Office

The water cycle, also known as the hydrologic cycle, refers to the continuous movement of water between the earth and the atmosphere. There are many components to the water cycle, but only the most important ones will be discussed here:

Evaporation and Transpiration
Condensation
Precipitation
Runoff and Groundwater



Evaporation and Transpiration

Evaporation is the process by which a substance changes from the liquid phase to the gas phase. On earth, the most important substance is water (liquid water into water vapor). Energy is required for evaporation to occur. Energy can come from the sun (radiation), the atmosphere (conduction) or the earth (conduction). When energy is extracted from the atmosphere to evaporate liquid water, the atmosphere will cool. This is also true if water evaporates off a surface. An example is when you step out of a pool on a warm, sunny day. The water on your skin will evaporate, removing heat from your skin, causing your skin to cool. Evaporation is very important because it is how water vapor, which is needed for clouds and precipitation, enters the atmosphere. Transpiration is simply the evaporation of water through plant membranes. It is another important way in which water vapor enters the atmosphere.

Condensation

Condensation is the process by which a substance changes from the gas phase to the liquid phase. As air containing water vapor rises into the atmosphere, it will expand and cool. If it cools to its dewpoint temperature, the air will become saturated and condensation will occur. Condensation can be observed in the atmosphere as clouds, fog, dew, or frost form. When condensation occurs, the heat required to originally evaporate the water is returned to the atmosphere, causing the atmosphere to warm.

Precipitation

Clouds are composed of millions of water droplets that have condensed. These water droplets grow into larger droplets by colliding and coalescing with one another. Eventually, the droplets can grow large enough that they will not be able to stay suspended in the cloud. When this occurs, they fall out of the cloud as precipitation. If the cloud's temperature is below freezing, it will contain ice crystals. Ice crystals collide and stick to other ice crystals and eventually fall from the cloud as snow. Precipitation is water, either liquid or solid, that falls from the atmosphere to the surface.

Runoff and Groundwater

Runoff and groundwater are both driven by precipitation. When precipitation falls to the surface, it will either be absorbed into the ground (groundwater) or, if the ground cannot absorb any more water, flow into streams. Eventually, even water that is absorbed into the ground will make its way into streams. The water in streams converges into rivers and flows back to the oceans. Finally, some of the runoff will be evaporated and some of the groundwater will be taken in by plants and then transpired.

Activities

Investigate Your Own Water Usage
Students will estimate how much water they use during a week; then keep a journal for one week of when they use water and estimate how much for each use. Then have them compare to their earlier estimate.

Ask if they remembered to include every time they had a drink other than milk and included foods that require water in the preparation. Did they include their dishes being washed? Their clothes? Discuss why they probably underestimated the amount of water they used (there are a lot of hidden uses—we often take clean water for granted.). From this discussion, begin the discussion of limited water. All of the water that will ever be on Earth is here right now. How does knowing that change how they use water?

Pollution – where might pollutants enter the water?
Have the students team up to investigate where the water comes from and goes to in their school. After they investigate, have each group draw a large diagram of how water flows through the school. The diagram should include anywhere there is a faucet or a drain (don't forget the bathroom stools!). Ask the question again, "Where might pollutants enter the water?" and this time they should consider each of the drains they have discovered. Now look at the connections – what goes into their drain could eventually show back up in their faucet or it could show up in the faucets "downstream." Brainstorm what is "downstream" from them, and what is "upstream" from them.

Supplemental Information

For a check off sheet for this activity:
http://www.epa.gov/region01/students/pdfs/gwa21.pdf

For an automated example of the water cycle:
http://www.epa.gov/safewater/kids/flash/flash_watercycle.html

Video III. We All Have a Place in the Watershed

TOPIC: Watersheds

Concepts

- How water flows from higher elevations to lower elevations

Understandings

- Students will be able to identify their own watershed
- Students will understand how human behaviors impact the watershed

The land we live on is divided into watersheds. A watershed is a land area whose runoff drains into any river, stream, lake, or ocean. Small watersheds, such as the watershed for the creek behind your house, or the watershed for the pond down the road, drain into small bodies of water and cover small land areas. The runoff from small watersheds join together and their combined areas become a new, larger watershed. Large watersheds, such as the Mississippi Basin, drain into large bodies of water and cover immense land areas. Despite their differences in sizes, all watersheds share common properties. They all perform the same function of transporting water over the Earth's surface. The watersheds encompass suburban lawns, parking lots and city streets, along with corn and soybean fields and wild areas. Water seeps down through the soil to aquifers, which are underground formations in rock and soil that contain enough ground water to supply wells and springs.

Many human activities have an effect on watersheds. Construction projects like dams can limit the flow of water; construction of roads and buildings can divert and even increase the flow of water. Agricultural fertilizers can run off of crop fields and inadvertently fertilize harmful microorganisms in rivers and lakes, having an adverse effect on water quality and marine life.

The irresponsible disposal of household and industrial chemicals can be harmful because these chemicals travel through the watershed, poisoning life and damaging natural ecosystems.

Watersheds can also have an effect on humans. Many communities use rivers, streams and aquifers as their source of drinking water. Water treatment prepares this water for human consumption, but if the water is laden with chemicals and microorganisms, it can be difficult to treat effectively. Floods are one of the major events in a watershed. Homes built on flood plains, low lying areas adjacent to rivers, are susceptible to flooding conditions when heavy precipitation exceeds the watershed's capacity to absorb water. Rivers, streams, and lakes overflow, threaten human lives and damage or destroy roads, buildings and flood control measures. Watersheds can also become dry, causing water shortages for those who depend on their lakes and rivers for drinking water.

It is clear that humans have a close relationship with watersheds. The responsible planning of watershed use and development is important to ensure that the ecosystems sustained by the watersheds are not destroyed. It is also important to protect the health and safety of our communities.

Activities

Students will identify their own watershed. This could be done as a group activity for the school's watershed, or individually for each student's home or farm. In some areas, these could be very different watersheds.

Visit EPA's "Surf Your Watershed" for local watershed information: http://cfpub.epa.gov/surf/locate/index.cfm

Watershed Properties

Identify: Prior to the demonstration, engage the students in activities involving identification of a local watershed. Maps can be used to facilitate this activity and a field trip to a local river or pond can serve to demonstrate the concept of a watershed. Ask students to identify where the water is coming from. How far does the watershed extend? For a small stream, the answer may be several hundred feet, but for a lake or river, the watershed may be much larger.

Objective: This experiment illustrates the basic properties of a watershed: how water flows from higher elevations to lower elevations and how watersheds are interconnected. The students will understand how the placement of buildings, roads, and parking lots can be important to watershed runoff and how careless use and disposal of harmful contaminants can have a serious effect on downstream watershed denizens.

Materials needed:

- 1 large Tupperware container (about 1.5' W x 3' L x 1' H)
- 2 lbs. of modeling clay
- 3 lbs. of sand (any type of sand will do)
- 2 lbs. of aquarium gravel
- 1 roll of wax paper (or any other impervious, water repellent surface, tin foil, plastic wrap, etc.)
- 1/4 cup of cocoa mix, iced tea mix, or other flavored drink mix (to represent chemicals)
- 1 spray bottle or bucket full of water

Procedure:

1. Wash the aquarium gravel carefully to remove any powdery residue that may add cloudiness to the water. Fill the container to about 2 inches from the bottom with the gravel. Slope the gravel slightly so, that at one end (downslope), the gravel is only about ½ inch deep and, at the other end (upslope), the gravel is about 3 inches deep. This gravel layer will represent the aquifer.

2. Mix the clay and the sand. The consistency of this mix should be gritty, with slightly more clay than sand. This mixture should allow water to run freely over it, but if left standing, the water should slowly permeate the surface. Add this mixture to the container carefully, so as not to disturb the slope of the aquifer already placed. The slopes should be similar, with about 2 inches of sand/clay mix overlying the gravel already placed, and on the downhill end there should be about 3 inches of gravel left exposed.

3. Carve a channel in the middle of the clay/sand layer, about ½ inch deep and about 1 inch wide. This channel will represent the main river of the watershed. Near the top of the slope, split the channel into two or three separate channels to represent tributaries. You may wish to add other tributaries along the main branch of the "river" to further illustrate other watersheds.

4. With some extra clay/sand mix, build little hills between the tributaries. These hills separate the smaller watersheds,

but when looked at as a whole, the entire "river" system is one watershed. You may also wish to add some small model trees or green felt to represent forests or fields. Buildings can be represented with small blocks of wood.

5. Along the main river, flatten out an area that is about 8 inches by 3 inches. Cut out a piece of wax paper to be about 4 inches by 3 inches in size. Stick this down onto the clay sand mix, sloping it slightly towards the river. If necessary, use some clay to hold the edges down. Explain to students that this wax paper represents the impervious surface of a parking lot.
6. Fill the bottom of the aquarium up to about 2 inches from the bottom with water. The water should fill all of the aquarium gravel "aquifer" area, and should just reach up to the lowest extent of the clay/sand mixture. Explain to students that the aquifer captures and transports water that seeps down through the soil.
7. Using the spray bottle, simulate rain over the flattened soil area and the parking lot. Ask the students to note that the "rain" soaks through the soil, but runs off the parking lot to the river. Discuss with students what the effect would be if the entire watershed was "paved."
8. Have the students sprinkle some cocoa mix over the sides of one of the smaller watersheds. The cocoa represents pollution. Over one of the unpolluted "watersheds," cause some rain with the spray bottle (*it may be necessary to cause more rain by pouring water). Note that the runoff from the rain is clean. Now, make it rain over the polluted area. Ask the students to note how the pollution travels down through the watershed, contaminating all downstream areas. Discuss with the students why the pollution is a problem, and what can be done to fix the problem.

Follow-up Questions

1. What are some possible sources of watershed pollution in your community?
2. What other impervious surfaces besides parking lots can cause excessive runoff in a watershed?
3. What can be done to reduce our impact on watersheds and their environment?
4. Using a map of the area around your house and EPA's "Surf Your Watershed," identify where the runoff from your driveway will end up. Can you track the path of potential pollution to a large body of water (i.e., ocean or bay)?
5. What is the quality of water in the rivers, streams and lakes in your watershed?

(Adapted from U.S. Environmental Protection Agency)

Supplemental Information

Iowa Watershed map on page 16.

Iowa Learning Farms handout: Iowa Watersheds

NRCS site with additional information about many of Iowa's watersheds:
http://www.ia.nrcs.usda.gov/technical/RWA.html

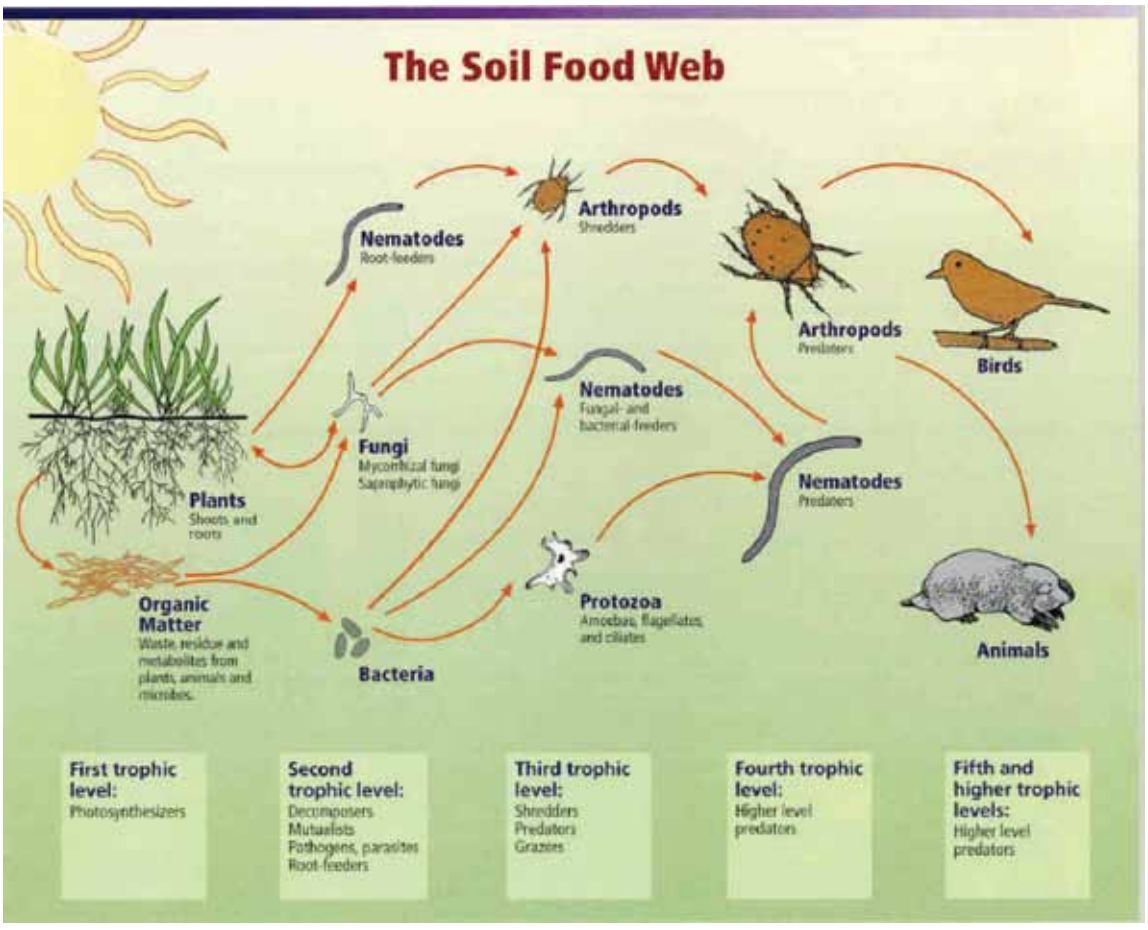
Facts on Drinking Water from the EPA:
http://www.epa.gov/OGWDW/kids/behyrdological.html

Video IV. Don't Call it Dirt: A Passion for Soil

TOPIC: Soil Food Web

Concepts
- The soil is alive

Understandings
- Soil quality and water quality are connected
- Soil is impacted by human management



From the National Resource Conservation Service's Soil Biology Web site
http://soils.usda.gov/sqi/concepts/soil_biology/soil_food_web.html

Activities

Schoolyard

Map your schoolyard. Where is the soil exposed? Where is it "capped" by asphalt/ cement or buildings?

Take a soil sample. What is the soil like now? Do some historical investigation. When was the school built? What was there before the school? What kind of soil would it have been (prairie, woodland, etc).

What kind of soil is in your watershed? Does it erode easily? What kinds of conservation practices are being used to hold the soil in place?

Consider inviting a conservation farmer to your classroom. See the ILF web site for contact information of a cooperator or spokesperson in your area. www.extension.iastate.edu/ilf

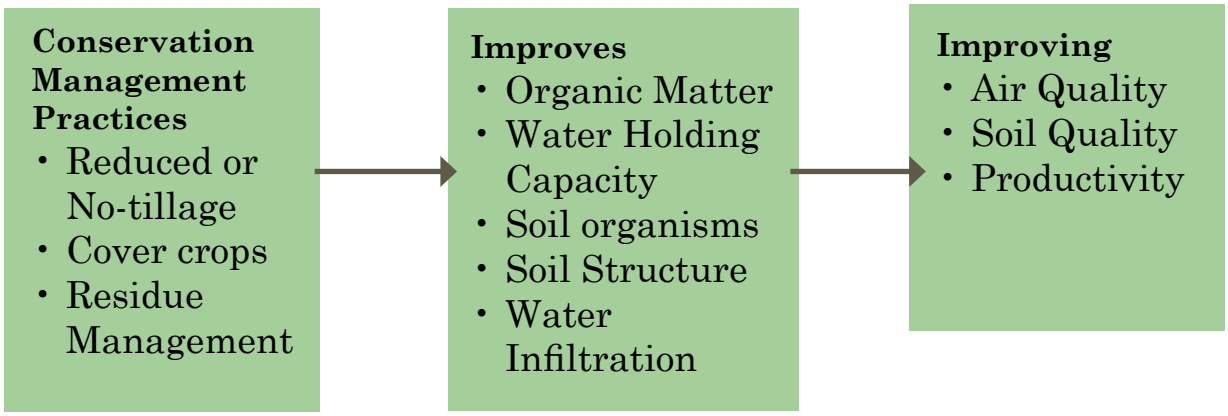
Ways to hold soil in place

Plantings – plants with lots of roots can hold soil in place. Grasses, shrubs and trees can all hold soil in place. Conservation farmers may plant cover crops in their fields to hold soil in place after the corn and soybeans have been harvested.

Structures – We can build structures that hold soil in place. These may be retaining walls or terraces. In cities and towns, you might see them in yards. You may also see them in farmers' fields.

Residue – Conservation farmers keep residue in their fields to reduce erosion and increase biological activity. In cities, you will see gardens with mulch (leaves or wood chips) covering the soil.

See if you can find examples in your schoolyard or neighborhood, or on the farms in the countryside.



Supplemental Information

ILF handouts:

Water Quality and Conservation Practices
Considering No-till
Economics of Residue

USDA-Natural Resource Conservation Service Soil Quality web page: http://soils.usda.gov/sqi/

Video V. The Work of Our Hands

TOPIC: Resilience Thinking

Concepts

- Diversity
- Adaptability

Understandings

- Students will begin to understand the impact of decision making on their own future

Humans depend on ecosystem goods such as food, timber and medicines, as well as services such as water and air purification, carbon storage, pollination and soil formation.

The challenge is to sustain the resilience of ecosystems – the ecosystem's capacity to cope with disturbances and maintain an adequate supply of goods and services. This is especially important in the face of global environmental change (such as global warming) which may cause more frequent and intense disturbances.

Diversity increases an ecosystem's ability to be resilient by providing many possibilities. In a healthy grassland, there are four or five species that can put nitrogen into the soil. If the temperature rises or falls, it may affect one or two of the species, but usually not all of them. So the system does not lose its ability to fix nitrogen.

Activities

Resilience Thinking

Have students look up the word "Resilience" and record definitions. Discuss what they think the word "resilience" means as used in the video.

"The ability to recover from or adjust easily to change or misfortune."
"The ability of systems to absorb change and still persist"

Investigate an occurrence of a change or misfortune the students can remember. Track what changes took place, and how the system recovered from it. (The floods in Iowa or the Dust Bowl would make excellent topics.)

Have the students look for examples of what changed before and after the event in terms of diversity and adaptability. For example, before the Dust Bowl, farmers began planting less diverse crops. As diversity decreases, the system becomes less able to adapt to change.

Creating your Preferred Future

What do you think is important to your future? How will food be grown? What kind of shelter will you live in? What kind of energy will be used? How will you travel? What will cities look like? What will the countryside look like?

Make a power point presentation, a drawing or a collage to represent this future.

What will it take to have that future? Will this future have more or less resilient systems than the present? Discuss this in terms of the two basic concepts – diversity and adaptability.

Supplemental Information

Resilience Thinking: Sustaining Ecosystems and People in a Changing World. By Brian Walker and David Salt

The Resilience Alliance: http://www.resalliance.org/2963.php

Designing an Ecologically Sound City: http://www.eduref.org/Virtual/Lessons/Science/Environmental_Education/ENV0019.html

Video VI. Reclaiming Stewardship

TOPIC: Behaviors and attitudes make a difference

Concepts

- Both individual and collective behavior impacts the environment
- Respect for each other and the earth

Understandings

- Individuals place demands on natural resources.
- Students will construct examples of how they can conserve natural resources

Activities

Where did all the water go?

Using sponges as an example, students need and use water daily in many ways, and often in unrealized amounts. Water is used directly for drinking (1/2 gallon a day). The sponges used will represent humans demands on the water supply on earth.

Materials needed:

- A big clear container with a wide mouth opening
- four sponges cut into eight pieces each
- water
- a bowl
- marker or masking tape
- paper towels
- drawing paper

Procedure:

1. Put about four cups of water in the container. Ask the students to imagine that the container represents the earth and the water represents all the available water
2. Students brainstorm the ways we use water (drinking, irrigation, recreation, cleaning, processing, bathing, transportation, etc.). Write these on the chalkboard for student reference.
3. With a marker or masking tape, mark the water level on the outside of the container. Drop a piece of sponge into the container as you share one personal demand you made on water today. Remove the wet sponge from the water level. It probably shows very little change.
4. Ask students, one at a time, to name a personal demand they made on water today while dropping a piece of sponge in the container. The students may begin to notice a change in the water level. After all the sponges have been dropped in the container, soaking up as much water as possible, remove all of them (don't squeeze them out) and set them aside in a bowl. Draw attention to the dramatic change in the water level. Help students understand that the demands of a lot of people have more effect than the demands of a few people on natural resources.
   Ask:
   What happens to the water level as we put in more sponges?
   What will happen if we keep using water at this rate?
   What can we do about this situation?
   How can we give water back to the environment?

5. Once the students have mentioned reducing, reusing, or recycling take one wet sponge, naming a way you can reduce or recycle, and squeeze the water out of the sponge back into the container. There is a change in the water level, but not much. One person reducing or recycling does make a difference. The impact, however, will be greater when many individuals reduce, reuse, and recycle.
   Ask: In what ways can you reduce, reuse, and recycle, or be more careful about the demands you make on water?
6. When students have an idea about how they can give back to the environment, have them squeeze the water out of a wet sponge back into the container sharing their idea with the class. The water level will go up. It won't go back to the original mark, however. Ask:
   Why doesn't the water level return to the original mark even after all the sponges are squeezed out? (Even by recycling resources, some of them will be used up.)
   Why is it important to you to reduce, reuse, and recycle, and/or make careful demands on water?
   What one thing have you learned about conserving water through the sponge demonstration? (Answers will vary, but should reflect an appreciation for the finiteness of many natural resources, the renewability of some, and the desirability of using natural resources wisely.)

Waste Not

Have students draw "Waste/No Waste" pictures showing themselves "wasting" and "not wasting." Have students fold pieces of white paper in half and on one side draw a picture showing how they might use water. On the other half, students can draw a picture of how they can save that resource.

Assessment: The students will demonstrate an understanding of water conservation by 1) Drawing an accurate picture of using and conserving water; 2) Writing a poem about one or more ways water can be reused, reduced, and recycled.

Don't Treat Mother Earth Like Dirt

Students will determine what it means to "treat" someone like "dirt" (e.g. disrespectful, uncaring, as if it didn't matter). Students will then brainstorm activities they have observed people doing in the natural world around them that they believe harms the natural environment. While working cooperatively in groups, the students will create pictures and write short paragraphs illustrating and describing the behavior and ways to accomplish the same behavior without harming the environment.

Materials needed:
- art supplies (e.g. crayons, scissors, glue, construction paper)
- magazines from various topics for real-life "photos"
- pencils

Procedure:
1. Watch the video "Reclaiming Stewardship"
2. After placing the students in cooperative groups, ask the students to help make a list of activities people do that seem harmful to the world that they live in. As responses are given, record them down on the blackboard or overhead transparency for the whole class to view. Students will use cut out photos from magazines and/or draw pictures to illustrate the stated harmful behaviors visually. Each group's cards will be collected and redistributed so that each group gets another group's pictures.
3. Ask the groups to analyze each of the cards they've received, directing them to discuss such things as: "What is happening?
   What specifically is being harmed?
   How does it effect others?
   Does it seem to be appropriate or inappropriate behavior? Why?
   Is the person doing it having fun?
   What are alternative forms of the same behavior that would be less harmful to the environment?"
   Each group will report to the rest of

the class, displaying the picture card and discussing their feeling concerning the harmful activity and their possible recommendation(s) for less harmful behaviors. After each group has had a turn to lead the discussion, the illustrative cards could be posted in the classroom science center as a reminder of the harmful way(s) people could behave in the environment.

4. The groups will split up, and each will be asked to complete the post-activity handout within 15-20 minutes, as it will be collected at the end of the class session.

Discuss what it means to respect each other. What are the behaviors that show respect? Link that to the earth. What are the behaviors that show respect for the earth? Draw on all earlier lessons.

References:
Lesson adapted from Corsentino, P. (1995). Ecosystem matters. Washington, DC: United States Department of Agriculture.

Supplemental Information

Peaceful Solution Character Education Incorporated (PSCEI):
http://www.peacefulsolution.org/curriculum/products/sample_lessons.html

Don't Treat Mother Earth Like Dirt

Let's all respect Mother Earth, now.
Let us work shoulder to shoulder.
Treat her real kindly, don't use her blindly.
Look after her as she grows older.

Mother Earth has valleys that feed us.
She has rivers and lakes that refresh us.
Nothing's insaner, than to fail to sustain 'er.
Let's show her we know that she's precious.

Don't treat Mother Earth like dirt.
Erosion, pollution—they hurt!
So, swear by your best flannel shirt
That you won't treat Mother Earth like dirt.
Don't treat Mother Earth like dirt.

Mother Nature is very resilient.
In the long run, she can get better
If the people and plants, the birds and the ants
Will all work together and let 'er.

Mother Earth is a real special lady.
Let's show her we're thinking about her.
Let's show her we care, and tell her we swear
That we couldn't live here without her.

Don't treat Mother Earth like dirt.
This is a real red alert.
That is why I reassert:
Don't treat Mother Earth like dirt!

lyrics by Owen Kalt, music by Ann Staudt, performed by Jacqueline Comito and Joyful Hearts

Iowa Watersheds