October 2015

4-H 402 Water Riches for Youth : Educator Workbook

4-H 402

Water Riches for YOUth

Educator Workbook

4-H Youth Development
Cooperative Extension, Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

_____
Date

_____
Your name, Your title

_____
Your business name

_____
Business address

_____
City State ZIP

Dear _____ :
Your name

As you probably are aware, our city's current landfill has been condemned and the city must build a new one and have it operational in 24 months. Because of this immediate problem, I am in the process of putting together a task force to help locate a new landfill.

I am asking you to serve on this committee. All the task force members will provide a balance of knowledge, insight and interest, a broad base of knowledge, not only subjects relating to landfills and protecting our natural resources, but also in understanding how important it is that people make educated decisions. These qualities will make you an unique and invaluable member of this team.

Some of the ground work has already been laid for this task force. My office has narrowed the number of possible sites down to five. Once the task force has met and discussed all five sites, your committee will narrow the field to three, then two, and finally, to its final recommended site.

We hope this will be a rewarding experience for you. I feel it will be very beneficial to bring together a cross-section of professionals and citizens to help make this important decision. I thank you, in advance, for the time and effort you will put in to help your community in this way.

The first meeting of this task force will be _____.
Day, Date, Time, Location

If you have any questions, feel free to call my office at _____.
We look forward to meeting you at the first meeting. Your mayor's office phone number

Sincerely,

Mayor

You just arrived at work and opened the following letter. Congratulations! You are now part of a special project to help your community overcome a serious problem.

For this exercise you are a Professional. You might be a Natural Resources administrator, A university professor in any subject - from soil science to political science, or any other educator who has the responsibility of gathering information and sharing it with the public.

Read this carefully to discover the importance of your role.

The Role of an Educator

On this team, you are the educator. Your role is very important. You must help your team members examine their information and the information of others as fairly as possible. You may have personal feelings about different team members and their positions about the landfill site. As an educator, however, you should try to help each team member present their information as accurately as possible.

You are going to have to:
- understand about working with groups, and how public policy decisions are made,
- understand how water moves above and below the ground and how above-ground activity can affect water quality,
- remain unbiased when presenting information.

Overview

Welcome to *Water Riches for YOUth!* You're going to find this a different kind of learning activity, so pay close attention.

This situation involves locating a new landfill in your community from among five sites. Careful consideration must be given to this issue. Your team must consider a variety of social, economic, political and environmental issues when determining which site to recommend.

You have been assigned to a community task force. The mayor's letter identified a serious problem with the landfill and a solution must be found.

As a member of this task force or team, you will take the role of a community resident with particular views and perspectives of the problem. The different ideas from the team members will help reach the best decision.

If you don't understand how this activity works, you're going to have trouble serving as a team , so please:
- **READ** this workbook carefully,
- **THINK** about your responsibility to your group, and
- **PERFORM** your role so your group can work effectively.

This workbook will guide you through interesting team problem-solving activity.

You are the only member on your team receiving this information.

NOTE: **You are the ONLY member of your team receiving the information contained in this workbook.** You need to understand your role and the information in this workbook.

Remember, a team is only as good as its weakest member. Do the best job you can — that's all your team asks.

Here's How This Activity Works

◆ Study the Sites

Your teacher will provide site sheets with basic data and maps.

Study the information provided. Ask questions. Search for other additional information that will help to make a decision. Look for long term and short term impacts of different decisions. Talk to experts in your community to help you gather information. You may have to make assumptions or guess about how the sites might be used and the environmental threats at the sites.

◆ Group Meetings

Your group will alternate between GROUP MEETINGS and INDIVIDUAL WORK SESSIONS. Your teacher will help you get the first group meeting underway and may call additional meetings from time to time when necessary.

The Team Leader will call the group meetings.

During the group sessions, you will discuss which landfill site to select. When your team seems ready (has discussed the issues, looked at options, weighed the advantages and disadvantages), you may call for a vote to determine the end of one round and the beginning of the next round. At the end of each meeting you'll need to complete the questions at the end of your workbook and discuss how your team is working.

◆ Rounds

During Round 1, all five sites will be discussed, and a vote will be taken to decide which three sites to continue discussing.

During Round 2, three sites will be discussed, and a vote will be taken to decide which two sites to continue discussing.

During Round 3, two sites will be discussed and a final vote will be taken to decide which site the group supports.

REMEMBER: You may hold more than one group session during a round!

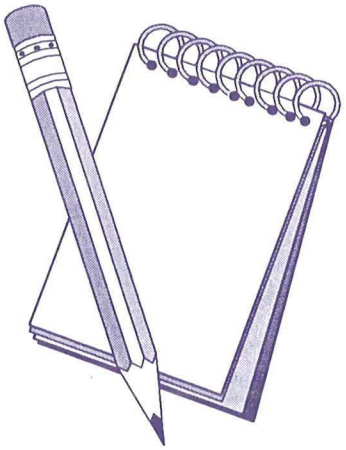
◆ Individual Work Sessions

During the individual work sessions, each team member will work from his/her workbook, to find answers to questions that arose during the previous group session. You may also work on laboratory experiences or special activities assigned by your teacher.

◆ Your Unique Role

Each person has a specific role, different from the others on the team. Read about the group problem. Talk with your parents and others in the community for ideas. Participate in the meetings as you think someone in your role would act.

Your teacher will evaluate the productivity of the entire group as well as your contribution.



NOTE: A round is not necessarily limited to a single meeting!

Moving Through the Rounds

Be Prepared!

One of the best ways to approach a problem-solving activity is to come to the meetings prepared. By writing down what you want to accomplish, when, how and who should be involved, you will help the group find workable alternatives and solutions.

Use the worksheets provided by the teacher. They will help you organize the presentations you bring before your team. This group problem-solving activity will take place in three rounds. Round 1 will begin only after the teacher and team leader believe everyone is ready. Rounds Two and Three will be called in that same manner.

If team members need more time to gather information or ask more questions — either individually or in group discussion — the round continues. **A ROUND ENDS ONLY AFTER A VOTE IS TAKEN!**

ROUND 1:
- The group will meet to discuss the features, advantages and disadvantages of each of the five possible sites for the landfill.
- Before closing Round 1, the group will VOTE to continue studying **THREE** sites.

ROUND 2:
- Discuss the advantages, disadvantages, alternatives to and consequences of the three sites still being considered.
- Vote on the three sites to narrow the field to two.

ROUND 3:
- Discuss the two sites, as above.
- Vote on which site group prefers.
- Prepare for final presentation, as teacher directs.

This workbook has a series of activities that you will complete during this project. Your teacher may provide additional activities and resources for you to use.

Understanding Water

Our Need for Water

Water is a natural resource — that is, it is a substance that exists in nature (natural) and that people, plants and animals can use (resource).

It is essential for all living things to survive.

Humans need eight glasses a day for good health. We need this water to:

- help our digestive systems,
- help us eliminate wastes,
- cleanse our skin, and
- help us stay cool.

Fish, aquatic plants and animals live in it. Plants need it to grow, absorbing water through their roots and leaves.

In addition, we use water for cleaning and flushing, for energy and recreation.

While water doesn't need to be "pure" to be healthful, contaminants can reach levels that create health hazards.

Water in Nature

In nature, water moves constantly through what is known as the *hydrologic cycle.* In this continuous cycle, water can exist as liquid, solid or a gaseous vapor as it circulates between surface water bodies, the atmosphere, and the land.

The earth's water has cycled this way since the beginning of time. Used water is not destroyed and new water is not created. It merely changes forms and keeps moving.

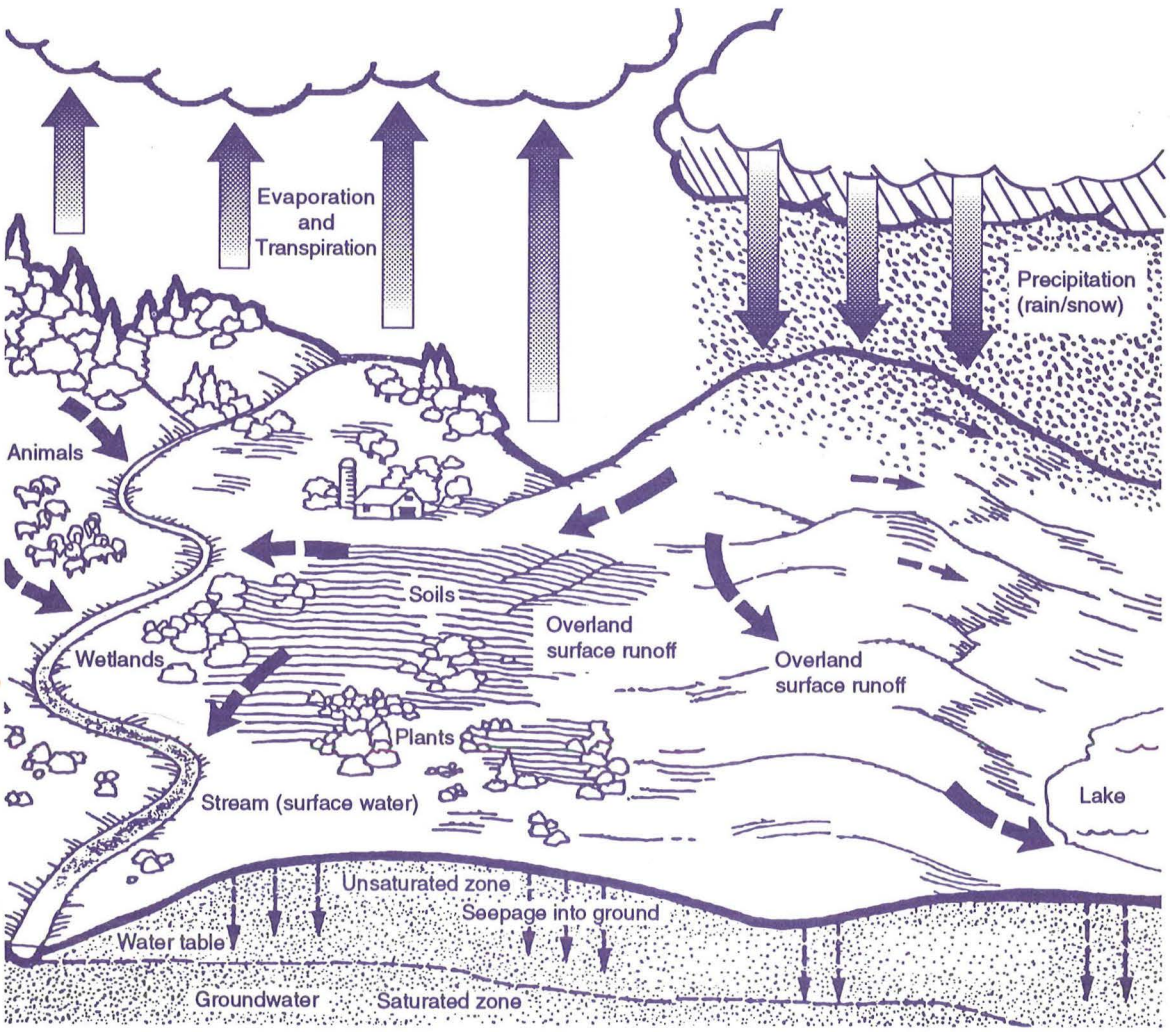
Above-ground Water Movement

Rain, snow, hail and sleet are all forms of **PRECIPITATION**.

Once on the ground, the water can soak into (**INFILTRATES**) the soil or run downhill to a pond, lake, stream, river or ocean (**RUNOFF**). All of these actions occur when water is in its liquid state (snow and hail need to melt before it can infiltrate or run off).

Water returns to the atmosphere in a gaseous state through *evaporation* from surface water bodies and soil surfaces. Water also returns by the process of **TRANSPIRATION** — plants absorb water from the soil and water vapor is given off from the plant leaves during the photosynthesis process.

Warm moist air rises, as cooling takes place the water vapor condenses, forming droplets. Then the vapor condenses, forming droplets. Eventually, these droplets grow too heavy to stay in the air and fall to the ground as precipitation. And the cycle starts again.



Source: Michigan State University

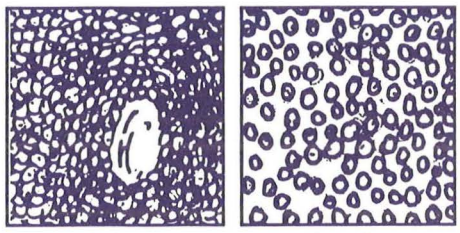
Below-surface Water Movement

In addition to above-ground movement, water is moving constantly below the earth's surface. Once moisture infiltrates the soil surface, the water moves downward, through the open spaces between the soil particles and in cracks and crevices. This water movement is called **PERCOLATION**.

Soils with similar-shapes, medium- to large-sized particles, such as sand and gravel, provide large, consistent spaces that allow water to pass through easily. Clay has very small soil particles that fit together tightly, creating very small spaces between particles. Water movement will be slow through a clay.

The rate at which water can pass through soil is called the soil's **PERCOLATION RATE** or permeability.

As water moves through the soil it will dissolve some of the chemicals that make up or are attached to the soil particles. Water moving in the soil can also carry suspended materials. The downward movement of dissolved or suspended substances by water percolating through the soil is called **LEACHING**. The leaching process can carry contaminants from soil at the earth's surface to our groundwater suppliers.



Clay Sand

Subsurface Layers

Underlying the soils at the earth's surface are a variety of unconsolidated materials. These soil-like materials range in size from a fraction of a millimeter (as in clay particles) to several meters (as boulders) and in varying proportions.

Deposits of these materials may range in depth or thickness from a few centimeters to hundreds of meters.

Unconsolidated deposits are underlain everywhere by consolidated rocks, which consist of particles of varying sizes. These consolidations have been welded together by heat, pressure and chemical reactions. Such rocks are commonly referred to as **BEDROCK**. Depending on the nature of these deposits, they may or may not yield ground water.

Groundwater Supplies

The term, **GROUNDWATER**, applies to areas under the earth's surface where all open pore spaces are filled with water. A subsurface zone that is capable of yielding ground water to springs or wells in a usable quantity is called an **AQUIFER**.

Aquifers can vary in vertical thickness from a few meters to several hundred meters. They may range in area from a few hectares to thousands of hectares.

Groundwater moves at variable rates (centimeters per day to tens of meters per day) in response to gravity and other physical factors. Groundwater flows downhill just like surface water, but the slope of the aquifer may not be the same as the land surface. Depending on the situation, ground water can travel very short or great distances over time.

People can use water from aquifers by drilling wells and pumping the water to the surface.

The most usable aquifers are large enough to hold large quantities of water and allow for easy water movement in the open (pore) spaces in unconsolidated and consolidated materials.

The upper surface of an aquifer is called the **WATER TABLE**. Water tables rise and drop according to the amount of **RECHARGE**, rainfall, irrigation, snowmelt, etc., that percolates down to the aquifer.

Surface Water

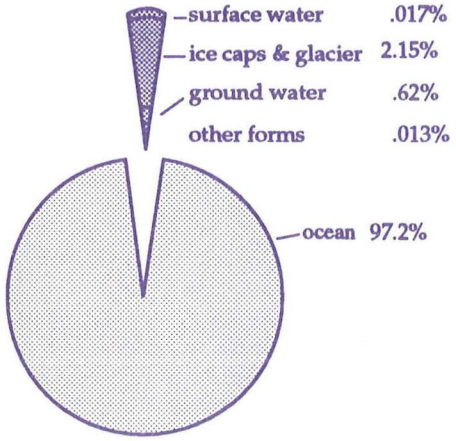
Nearly three-fourths of the earth's surface is water. Surface water includes ponds, lakes, streams, rivers and oceans. Nearly 97 percent of all the earth's water is in the oceans, which is salt water. Salt water can be used only by those fish, plants and animals adapted to it.

Humans and most plants require fresh water for survival. Unfortunately, only three percent of the earth's water is fresh water.

Where Surface Water and Groundwater Meet

The relationship between groundwater and surface water is complex. Groundwater aquifers and surface water bodies may or may not be directly connected. In some cases ground water may be discharged into surface water while in other situations water may flow from a surface water body into an aquifer (ground water recharge). Streams are often referred to as gaining or losing streams depending on whether groundwater is entering the stream or the stream is recharging the groundwater. In situations where there is no direct connection between the surface water and groundwater, surface water flow or storage will be dependent on the amount of overland runoff.

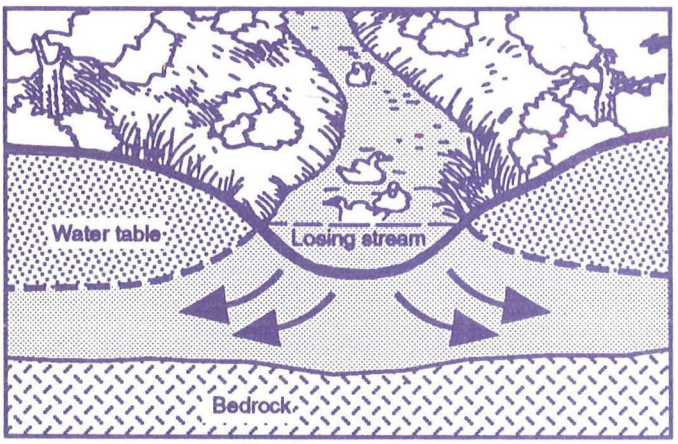
Earth's Water Supply



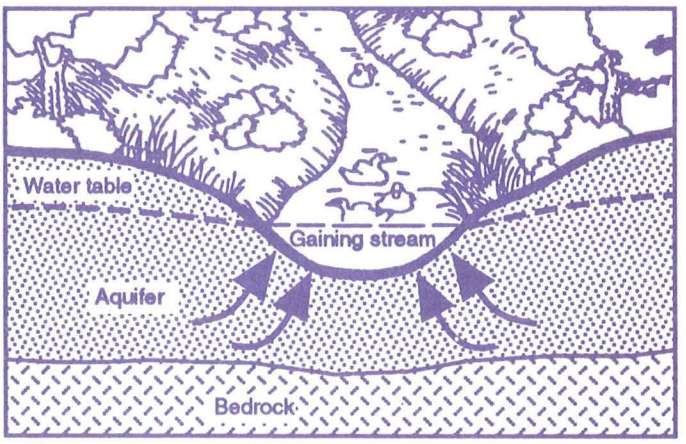
Questions

Look at maps and soils descriptions for the proposed landfill sites. Which sites would be most susceptible to leaching? Why?

Why is this an important factor to consider when siting a landfill?



Losing streams



Gaining streams

Source: Michigan State University

Facts or Opinions

As you work with your team, you must help them separate the statements of fact and the statements of opinion.

A fact is true information about something. Factual statements can be proven. For example, you could request official records to prove that "the city's current landfill has been condemned."

An opinion is what a person thinks about something. Opinions are statements of feelings, emotions or judgements and often reflect our values or what is important to us. Note the "clue" words in the following opinion statements.

The Mayor appointed the best people to the task force.
She should be elected for a second term.

Words like "best" and "should" indicate judgement. Can you think of some additional words you use to express feelings or judgements?

Any public policy issue contains both facts and opinions. After all, the mayor has asked your task force for its opinion about where the landfill should be.

If your opinions are based on facts, you will have a stronger argument. For example, you might say, "I think the landfill should be located on site X. It already has a clay soil that will help keep contaminants from leaching into the soil. In addition, the site is half a mile from the nearest home."

You stated your opinion and gave two facts to support it.

Arguing strictly from opinions without facts to support your opinions makes you look biased. The rest of the task force may begin to take your opinions less seriously.

Remember that as a task force, you will be asked to explain the reasons for your recommendations to the Mayor and community members. Before they accept your opinion, they will want to know the facts that support it.

An educator's role is to help provide facts. Your main objectives are to provide unbiased information and to challenge your group members with these two questions:

1. What are all the alternatives that should be considered to address the problem?

2. What are the consequences associated with each alternative?

Look up the following words in a dictionary and write the definitions in the space below.

Biased:

Unbiased:

Fact or Opinion Statements

Read each of the statements below. On the line beside each, write whether it is a fact (F) or a opinion statement (O).

_____Water moves more quickly through sandy soil than through clay soil.

_____ A landfill will destroy the neighborhood.

_____ All living things require water to survive.

_____ Garbage trucks are ugly.

_____ Surface water contributes to moisture in the atmosphere.

_____It is more important to consider land values than wildlife when selecting a site for a landfill.

_____ Groundwater can mix with surface water in some cases.

_____Only technical experts should be involved in deciding where a landfill should be placed.

_____Groundwater is a major source of drinking water.

Understanding Trade-offs

Trade-offs are something we all have to live with every day. That's because what is good for one person (or segment of society or the environment) may be harmful to some other person (or segment of society or the environment).

For example, we all expect to find attractive, affordable fresh fruits and vegetables in our local grocery stores. But some of the fertilizers and pesticides (to kill weeds and insects) farmers use to raise those food items can sometimes harm the environment.

Yet, without pesticides, the food might be more expensive because of fewer bushels for the farmer to harvest. And the produce might be less attractive due to insect damage and fewer nutrients in the soil to feed on.

You can see that there are reasons to use fertilizers and pesticides, and there are reasons to oppose their use.

As a result, the government establishes POLICIES to try to reduce the negative impact of the trade-offs.

For example, the government has adopted policies regarding chemicals in agriculture. Three examples are:

1. All pesticides must be approved by the United States Environmental Protection Agency after rigorous field and laboratory tests are conducted to determine their safety. These tests show how the chemicals work in the soil, how the chemical breaks down or carries over in the soil from year to year, health and environmental risks of using the chemicals, and more.

2. All people who handle restricted use agricultural chemicals must attend classes to learn how to handle, apply and store the chemicals. They also learn safety procedures.

3. The Safe Drinking Water Act requires that public water supplies, this includes communities, must test on a regular basis for potential contaminants.

These are examples of the thousands of policies that governments at all levels must deal with every day. A policy is set only after weighing the trade-offs involved.

Let's look at how trade-offs work in our first policy example — requiring several years of testing before chemicals can be sold for use.

The testing helps protect humans, animals and wildlife and the environment from long-term affects that might not be noticed until the chemical has been used for five years.

But what happens when a rare insect infestation in sweet corn growing in Idaho, and one of the chemicals being tested is believed to be "the perfect solution" to controlling those insects? Usually, the chemical will not be made available, the insects will live and the sweet corn will not.

Trade-offs are a part of life because:

- **not all people want the same thing;**
- **not all people have the same values;**
- **not all people agree on one answer.**

The testing takes time to complete. And during those years research scientists make use of very sophisticated equipment which monitors the chemicals and their effects with extreme accuracy.

That expensive time and equipment must be paid for, so the costs are transferred to the people who use the chemicals once they are on the market (and that means almost every one of us!). The costs of research, then, are passed on to the consumer, which increases the price of the product.

Yes, trade-offs do exist. Not everyone is happy with the trade-offs they must make in some cases.

But the trade-off to "no trade-offs" would be to try and please everyone . . . to make no policies at all so you would make no enemies. But would that really make everyone happy?

Of course not.

Policies do force people to accept trade-offs. But policies help establish a guideline for people to live by so a society can go on with day-to-day business.

Policies — and trade-offs — are a necessary part of the decision-making process.

Based on what you know about the landfill sites from your work and the information your team members have shared, what are the important factors being discussed? Place a check for each site that would be acceptable for that factor. Write the factors in the spaces on the grid.

Site Trade-Offs

Factors	Site A	Site B	Site C	Site D	Site E

Did you rate one site satisfactory for all the factors?

Which site(s) come closest to being satisfactory for the most factors?

What type of trade-offs may need to be made to select a site?

Which factors are you willing to compromise to select a site?

Which factors are you unwilling to compromise?

Evaluating Our Progress after Round 1

Rate yourself on the following items with 5 being the best.

I was prepared for our meeting	5	4	3	2	1
I shared information that helped us evaluate the sites	5	4	3	2	1
I listened carefully to what others had to share	5	4	3	2	1
I asked questions to gain more information	5	4	3	2	1
When I didn't agree with someone, I did so in a friendly manner	5	4	3	2	1

What is one thing you can do next time to help the group function better ?

Answer the following questions as a group.

As a group, what are some things you all need to work on next time ?

What is the most important thing you accomplished in this round ?

What would you like to accomplish in the next round ?

Evaluating Our Progress after Round 2

Rate yourself on the following items with 5 being the best.

I was prepared for our meeting	5	4	3	2	1
I shared information that helped us evaluate the sites	5	4	3	2	1
I listened carefully to what others had to share	5	4	3	2	1
I asked questions to gain more information	5	4	3	2	1
When I didn't agree with someone, I did so in a friendly manner	5	4	3	2	1

(continued on page 15)

What is one thing you can do next time to help the group function better ?

Answer the following questions as a group.

What are some things you all need to work on next time ?

What is the most important thing you accomplished in this round ?

What would you like to accomplish in the next round ?

Evaluating Our Progress after Round 3

Rate yourself on the following items with 5 being the best.

I was prepared for our meeting	5	4	3	2	1
I shared information that helped us evaluate the sites	5	4	3	2	1
I listened carefully to what others had to share	5	4	3	2	1
I asked questions to gain more information	5	4	3	2	1
When I didn't agree with someone, I did so in a friendly manner	5	4	3	2	1

Answer the following questions as a group.

What is the most important thing you accomplished in this round ?

What do you feel the strengths of your group were ?

What do you feel the weakness of your group were ?

What other type of problems may you solve in the future using this same technique ?

Prepared by

Shirley Trout, Writer
DeLynn Hay, Extension Specialist Biological Systems Engineering
Ken Schmidt, Extension Youth Specialist
Karen Melang, 4-H Communications Coordinator
Deb Hall, 4-H Youth Specialist
Terri Trotter-Wiles, Editor
Kristi Snell, Graphic Designer

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth R. Bolen, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.