

AG IN THE CLASSROOM—HELPING THE NEXT GENERATION UNDERSTAND THEIR CONNECTION TO AGRICULTURE

Colorado Fires!

Last year in Colorado, more than 1400 fires burned 370,000 acres. Several years of drought made 2002 one of our state's worst fire years. When we don't get enough rain and snow our forests are in more danger from fire than usual. With hot

summer temperatures and wind the danger grows. Wildfires are often started by lightning strikes. But last year, several large fires were started by people.

The Hayman fire was the largest fire in Colorado history. This human-started fire burned more than 137,000 acres southwest of Denver. That is an area 40% larger than the city of Denver.

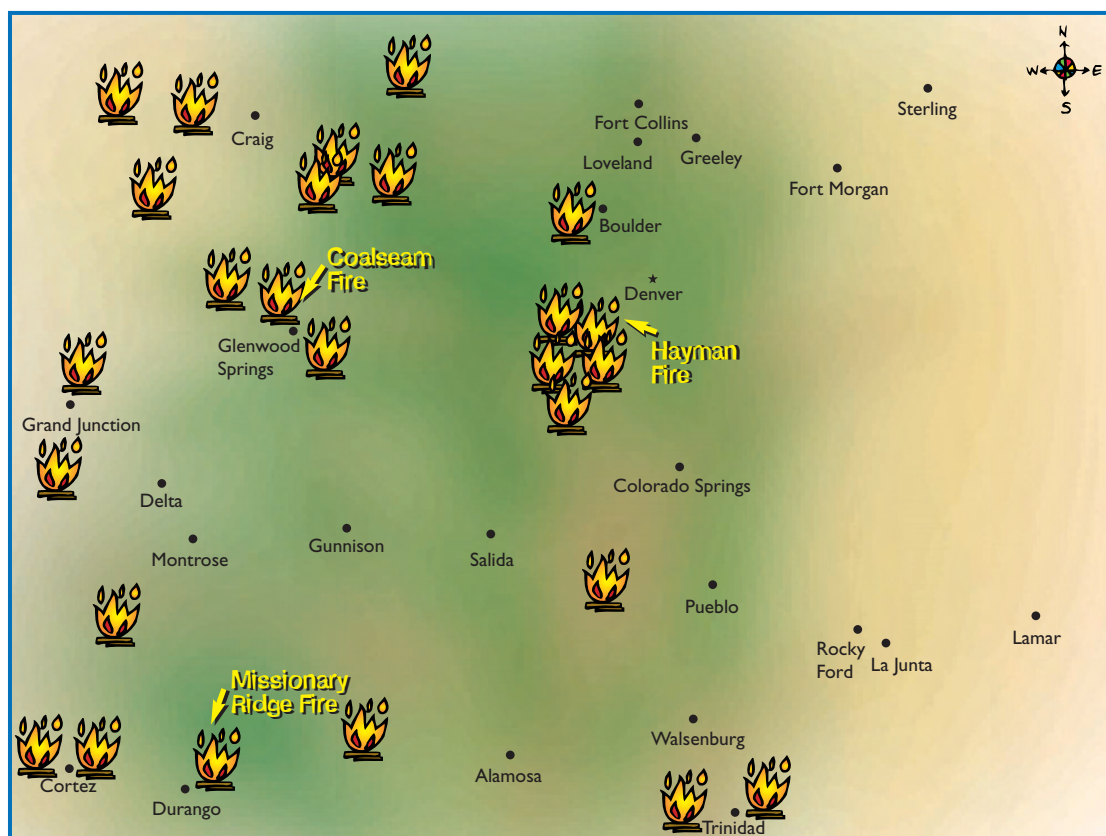
In the southwest corner of the state near Durango, the Missionary Ridge fire consumed more than 68,000 acres and 80 buildings. It was also started by a person.

The Coalseam fire near Glenwood Springs burned more than 12,000 acres and many buildings. It started from a

FUN FACT

More than half of wildfires are human-caused. Wildfire means any unwanted or planned fire burning in forest, shrub or grass.

burning layer of coal that has been smoldering underground for about 25 years.



Shown above are some of the fires that burned in Colorado during 2002.

Fire—The Good, The Bad and The Ugly.

Fires are a natural part of the forest ecosystem, and putting them out isn't always good. For the last hundred years we have worked very hard to prevent and suppress fires. This means that a large amount of dry pine needles, leaves, twigs, branches, brush and trees have built up in our forests. The more dry fuel there is, the hotter a fire burns once it starts. These large, hot, infrequent fires cause more damage than the smaller, frequenter fires we have had in the past.

Instead of staying close to the ground, these extra hot fires burn all the way to the top of the forest, killing even large trees. For this reason they are called crown fires. These are bad fires. They harm soil, habitat, property and can kill people.

Because of this, sometimes forest managers clear away this dry material and thin out some of the trees. Other times they let wildfires burn out by themselves or they may even set fires on purpose. These are called "prescribed burns." They are good fires because they help clear out the dead material. This is especially important in Colorado, where decomposition of dead plants occurs slowly because of the dry climate. Fires are necessary to help recycle nutrients into soils.

Planned fires can decrease the chance of a wildfire getting out of control. It also gives the forest a chance to grow new plants and creates food for animals. Plus, fire

can stop diseases such as pine beetle disease by killing the bugs and the weak trees that host them.

Plant Adaptation

A few plants such as aspen, lodge pole pine and ponderosa trees have adapted to fire. Aspen trees sprout from underground stems and roots. In unburned areas aspens produce thousands of seeds that blow into the burned area, so they are one of the first types of trees to grow back after a fire.

Ponderosa pines have very thick bark that helps insulate the tree from fire. They also lose their lower branches as they get older so that fire has a difficult time climbing to the top of the tree.

Lodge pole pine trees have special pinecones that open up during the intense heat of a fire. The seeds fall to the ground and take root in soil burned bare by the fire. Fire also creates sunlight openings in the forest that help seedlings grow.



Park Rangers work on the ground and in towers spotting fires and hotspots

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Losing Ground.

How does fire effect soil?

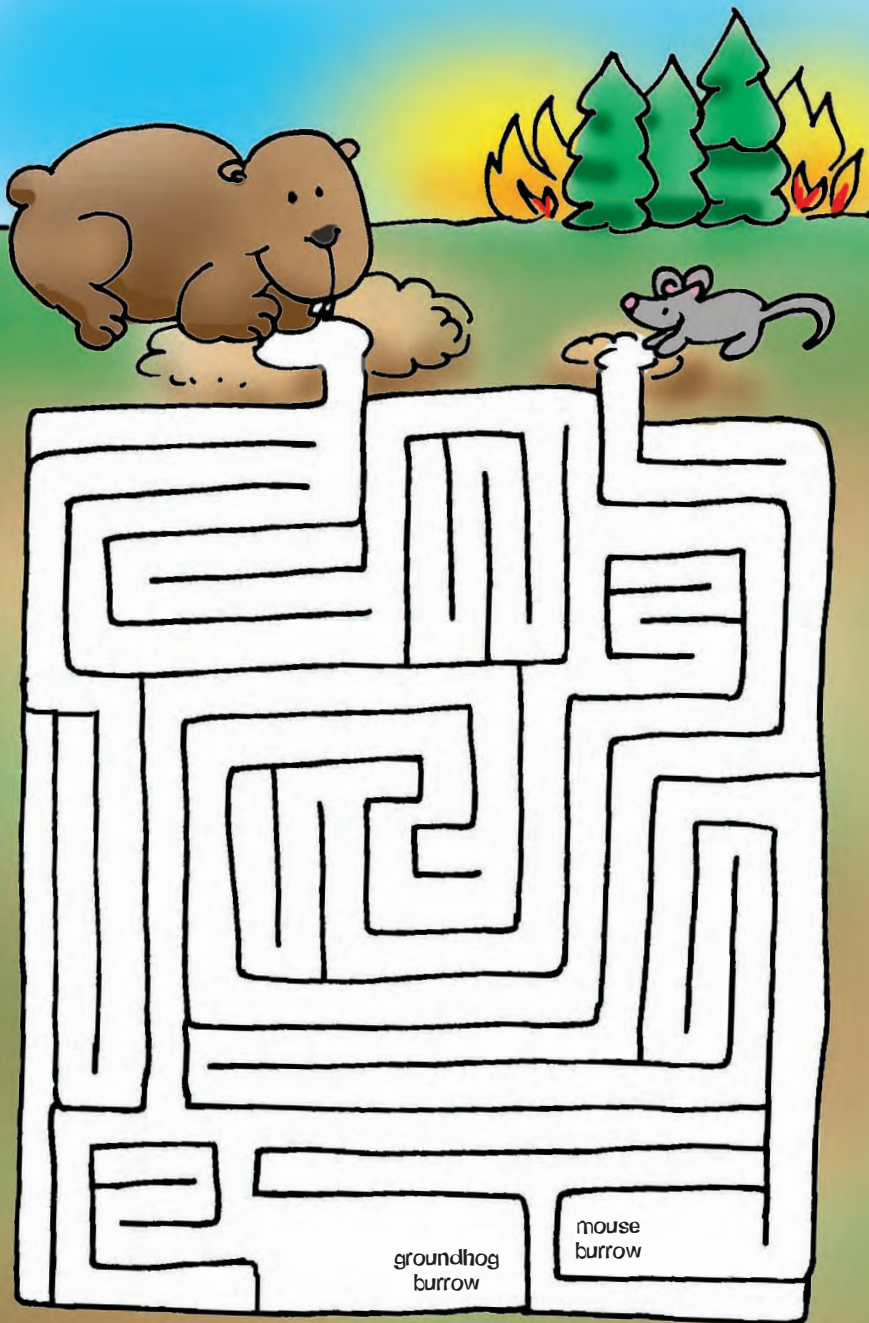
After a fire burns, soil temperatures can be higher than normal because the sun shines directly on the soil without the shade of plants and trees. This can help cooler soils become better places to grow plants. Also, higher soil temperatures make the snow melt earlier and faster after a storm or in the spring. The ash created by fire helps add minerals to the soil that new plants need.

High temperature fires can cause the soil to become hydrophobic, meaning that water cannot soak in. This happens when plant material burns and creates gas that penetrates into the ground. When the gas cools it forms a waxy substance around the soil, clogging air spaces and stopping water from soaking in. This makes less water available for new plants to grow.

Crown fires burn all the plants so that nothing is left to hold soil in its place. When it rains or snow melts, the water rushes downhill taking the soil with it. This erosion leaves less soil for plants and puts sediment (such as dirt, topsoil and other debris) into rivers and lakes causing major problems in our streams, lakes and reservoirs.

Weed Invasion

Sometimes noxious weeds are the first plants to come back after a fire. Noxious weeds are those not native. The seeds are from another part of the world and have no natural enemies here. This is bad for both plants and animals. Noxious weeds can prevent the growth of plants that are normally found in the fire area. They crowd out native plants that animals would normally eat.



Help the groundhog and mouse crawl to safety at the bottom of their burrows.

FIRE FACT

Each year more than 4,500 Americans die and more than 30,000 are injured in fires, many of which could be prevented.

What happens to animals?

Large animals such as deer, elk, bear, coyote and mountain lions usually have time to run away from a fire. Birds fly away, but baby birds or eggs can die since they can't escape. Smaller animals such as squirrels, mice, badgers, raccoons, shrews, ferrets and skunks burrow deep into the ground. The soil helps protect them from the high temperatures of a fire.

Coming Through Fire and Water.

Flooding can be a problem in areas that have been burned. There are no plants to stop the flow of water from rain showers or storms, so less of the water soaks into the ground and more runs downhill. This means that flash flooding and mudslides can happen. The flooding and mudslides can damage roads, homes, habitats and threaten lives.

Another problem is pollution. In 1996, the Buffalo Creek fire burned 11,900 acres west of Denver. One and a half months later, a severe thunderstorm caused flooding. Ash, buildings,

trees and propane tanks were swept into Strontia Springs Reservoir, which provides drinking water for Denver and Aurora.

This polluted the drinking water and many people complained of "smoky-tasting" water. This is called non-point pollution, meaning that it doesn't come from one source, but many.

It cost almost a million dollars to remove trees and other debris from the reservoir. Sediment from the floods filled one-third of the reservoir, which means that it cannot hold as much water now.

The Hayman fire could have the

same effect on Cheesman Reservoir which also supplies drinking water to Denver.

What happens to fish?

When the temperature of water in streams gets too high during a fire, fish die. In addition, the sediment and new minerals that flow into streams, rivers and lakes can effect the pH (acidity) of the water, killing small water organisms.

Over time, fire can be a good thing. The ash and nutrients from burned trees can help streams become a better habitat for insects and aquatic life. When this occurs the fish will come back.

Reduce each fraction below to it's lowest terms.

Then use the letter key and fill in the blanks at the bottom to answer the question.

1. $\frac{6}{16}$

2. $\frac{3}{9}$

3. $\frac{6}{9}$

4. $\frac{8}{10}$

5. $\frac{2}{6}$

6. $\frac{7}{14}$

7. $\frac{5}{10}$

8. $\frac{4}{12}$

9. $\frac{3}{18}$

10. $\frac{4}{6}$

11. $\frac{12}{16}$

12. $\frac{12}{15}$

13. $\frac{5}{15}$

14. $\frac{3}{24}$

15. $\frac{9}{24}$

16. $\frac{2}{8}$

17. $\frac{6}{15}$

18. $\frac{10}{12}$

19. $\frac{12}{20}$

20. $\frac{3}{12}$

21. $\frac{8}{12}$

22. $\frac{12}{32}$

23. $\frac{4}{14}$

Letter Key

$\frac{2}{7} = Y$ $\frac{1}{3} = E$ $\frac{1}{2} = L$

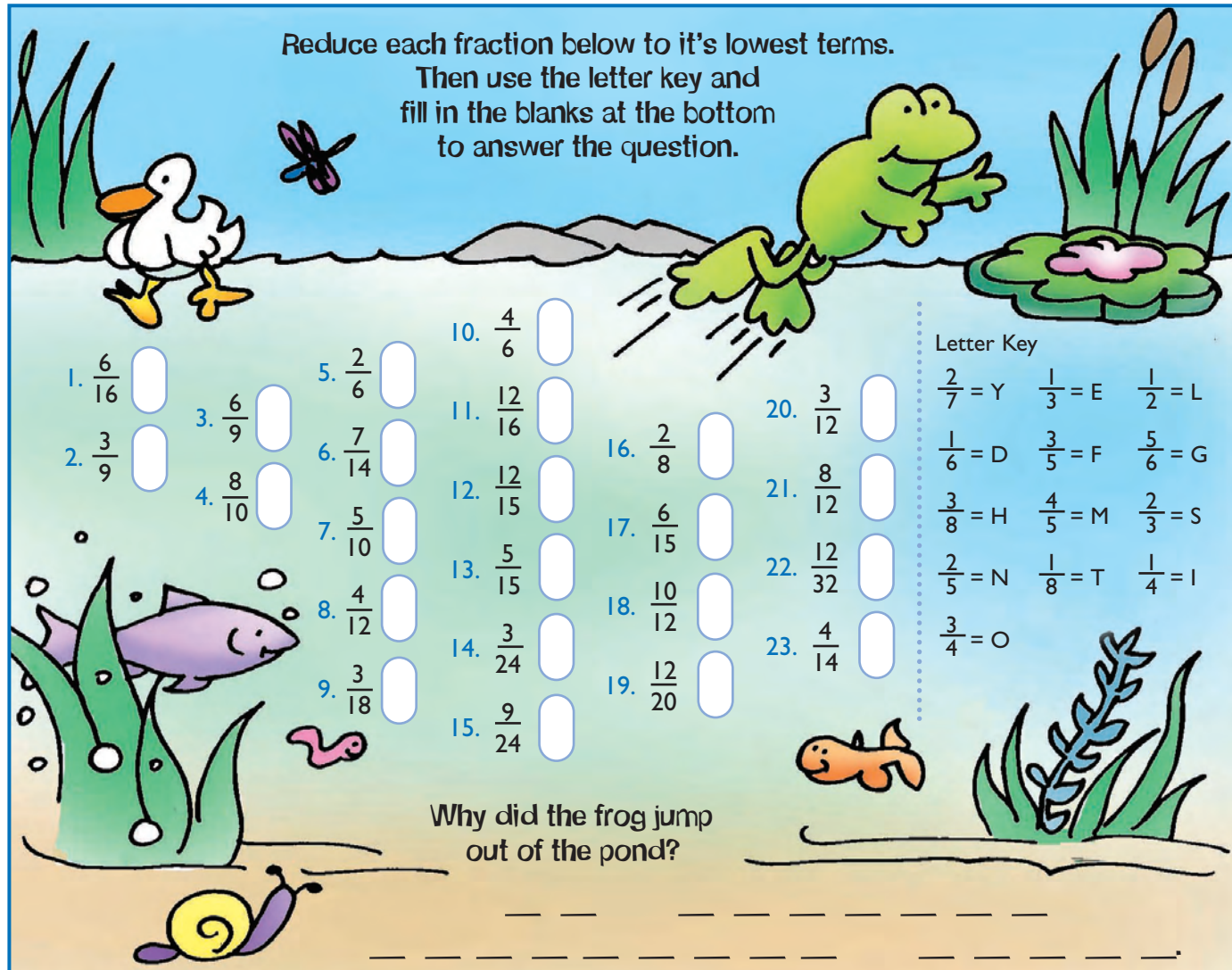
$\frac{1}{6} = D$ $\frac{3}{5} = F$ $\frac{5}{6} = G$

$\frac{3}{8} = H$ $\frac{4}{5} = M$ $\frac{2}{3} = S$

$\frac{2}{5} = N$ $\frac{1}{8} = T$ $\frac{1}{4} = I$

$\frac{3}{4} = O$

Why did the frog jump out of the pond?



WordsearchWordsearchWordsearchWord

Circle the words in the wordsearch puzzle that are in blue in the story below. Answers are either vertical or horizontal. Clue: There are 13 words to find.

N Q K L S O C P U S C A R I F I C A T I O N P C J
P O E C E Z O P C V U I W O B C I E O S P L E M N
T H Y D R O P H O B I C C U I Q I C P O S F R B T
J O Q J O B E F E L O P G K E U I B N Q H L P A P
U K E O S R E S E E D X M W A T T L E S V D E O M
Y U N R I S J C V I N J O P Y K N W S D O N N U P
W I N R O C P A W Y E M P O P M E T W T R I D S H
G A R M N E T T I N G M I P Q P A S U H N Y I C M
D I R E C T I O N A L L O G F E L L I N G V C I W
S O E M T M E T I N H G S D P O N S S T W R U K O
U T L K E I Y O E U X P V C T T E M O T M U L C H
N D A Y O N A T I V E G R A S S U G I E T S A S D
A O H L L W E H A T S F I L L E M U L P W H R E N
I G R E H A B I L I T A T I O N E T O W D N Q F I
R E N D S I H E P P L E N V I R O N M E N T O H E

The Dirty Work—Rehabilitation After Fire

Rehabilitation is a pretty big word, but don't let that slow you down. It simply means to restore to good condition again.

The first goal of rehabilitation after a fire is to prevent **erosion**. There are many things land managers do to accomplish this. One is **scarification**. That's another big word that means breaking up and mixing the top part of the soil using construction equipment or rakes. This helps **hydrophobic** soil absorb water and prepares the ground for planting grass or trees.

Directional log felling is used on burned slopes where there are a large number of dead trees. It uses the dead wood for a good purpose. People cut the trees and position them across the hill

(**perpendicular** to the direction water runs off). Stumps are used to hold and stop the trees from moving downhill. The trees then help trap water and debris.

Sometimes straw bales and straw **wattles** are used in a similar way to logs. Wattles are tube-shaped plastic nets filled with straw. They are positioned across the slope in places that water drains down. This creates little dams that slow down the flow of water and other material from the fire.

It's important to **reseed native grass** or other grains soon after a fire to help hold the **soil** and prevent erosion. If the plants can grow quickly they will help keep weeds out too. On steep rocky slopes, this isn't possible.

Sometimes **mulch**, such as straw, is used on slopes that have been seeded. To prevent the straw from blowing or washing away, plastic or natural fiber **netting** is sometimes used to hold it in place. This helps reduce soil erosion and provides a good place for plants to re-grow. The netting will fall apart over time so that it doesn't hurt the **environment**.

Restoring the land can take years to complete but is very important after a fire. Volunteers working with land managers can help revegetate the land.

FIRE FACT

In less than 30 seconds a small flame can get out of control and turn into a major fire.

Water, Wonderful Water!

Water is constantly recycled. The water in the cells of your body may have been in a prehistoric ocean where dinosaurs swam millions of years ago. The soda you drink tomorrow may be made with water from an ice-age glacier. The snow you ski on this winter in the mountains may end up on the table of a fancy restaurant in California this summer.

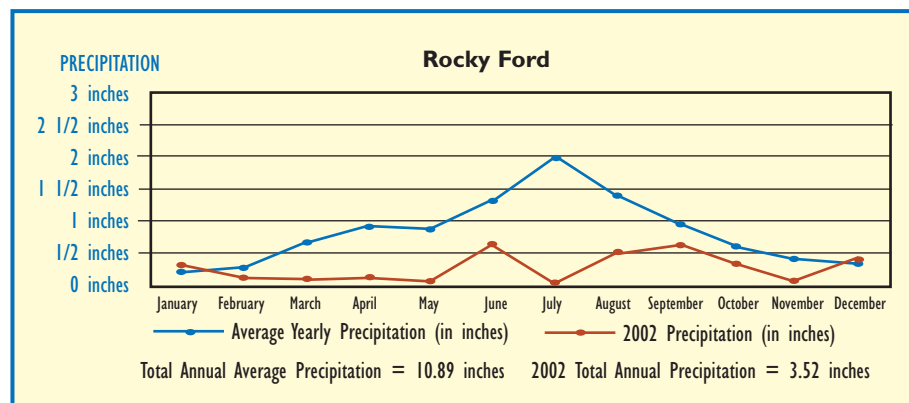
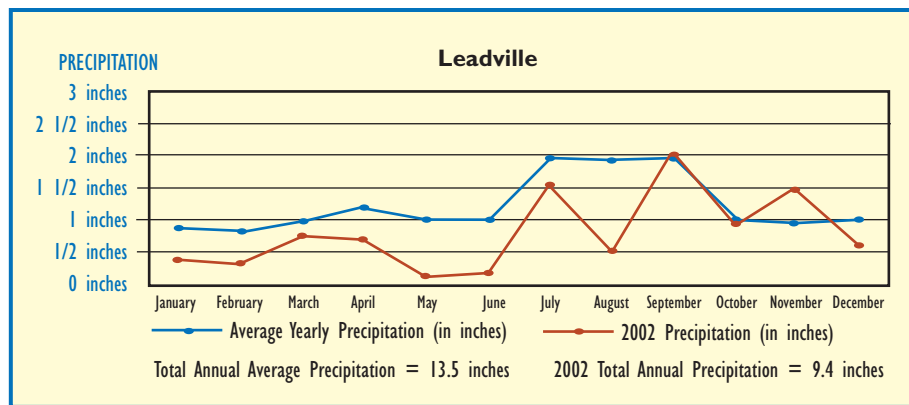
Water is not always where we want it to be. It does not always come in the amount we want. Sometimes there is not enough water; other times there is too much water.

Colorado is a semi-arid state. Most of our precipitation falls as snow in the mountains in winter and then melts and runs into streams in the spring. If we don't get enough snow in the mountains, not only are the skiing conditions poor, but we won't have enough water for farms or for watering our lawns in the summer. The challenge is in trying to reduce our use of water through conservation so water stored in reservoirs lasts longer. In drought years, there still may not be enough water even when we have water in our reservoirs.

Fourteen other states and Mexico depend on water from Colorado. Water from the Colorado River and other rivers flows into other states and is used by millions of people.

FUN FACTS
 "When the well's dry, we know the worth of water."
 —quote from Benjamin Franklin two and a half centuries ago.

Precipitation In The Mountains and The Valleys



Leadville is in the mountains, near the headwaters or beginning of the Arkansas River. The river carries water from snow that melts in the spring and runs down the slopes. When Leadville doesn't get as much snow as usual in the winter there isn't as much water in the Arkansas River in the spring.

Rocky Ford is a farm community on the plains downstream on the Arkansas River. They had exceptionally bad drought conditions during 2002 (worse than most of Colorado), making the ground very dry. The farmers get some of their irrigation water for crops from the Arkansas River, but during 2002 there was much less water in the river than usual.

How do you think this affected the farmers in Rocky Ford? _____

Did Leadville or Rocky Ford have more precipitation in 2002? _____

If Rocky Ford got 11 inches of precipitation in 2003 would that be considered a drought? _____

If Leadville got 11 inches of precipitation in 2003 would that be considered a drought? _____

In 2002 in Rocky Ford, which month received the least precipitation? _____

In an average year in Rocky Ford, which month receives the most precipitation? _____

Colorado—We're High and Dry.

Not enough rain and snow causes drought. Drought means different things in different places. eight inches of precipitation is normal for Rocky Ford, but would be below average for Leadville. Drought simply means less water than usual in a certain place.

In states such as ours which are experiencing population growth, there is more and more competition for water. Cities need water for the people who live there. Farmers need water for raising food. People want water in their reservoirs for swimming and boating. The water is limited and everyone wants it.

In Colorado, we are in the third year of a drought. There is less water in our soil, rivers, wetlands and lakes. This means less water for animals and that many plants and trees dry out and die. There are more forest and range fires. Soil erosion and damage to wildlife habitat goes up. Over time, insects and plant diseases increase in the weakened plants.

People who depend on water for a living, including farmers, earn less money because they can't grow as much food as usual. So prices for food might go

up and people might move from the country to the city looking for work. Businesses close down and there are fewer jobs. Poverty increases and crime goes up. Finally, the state can't collect as much money from taxes.

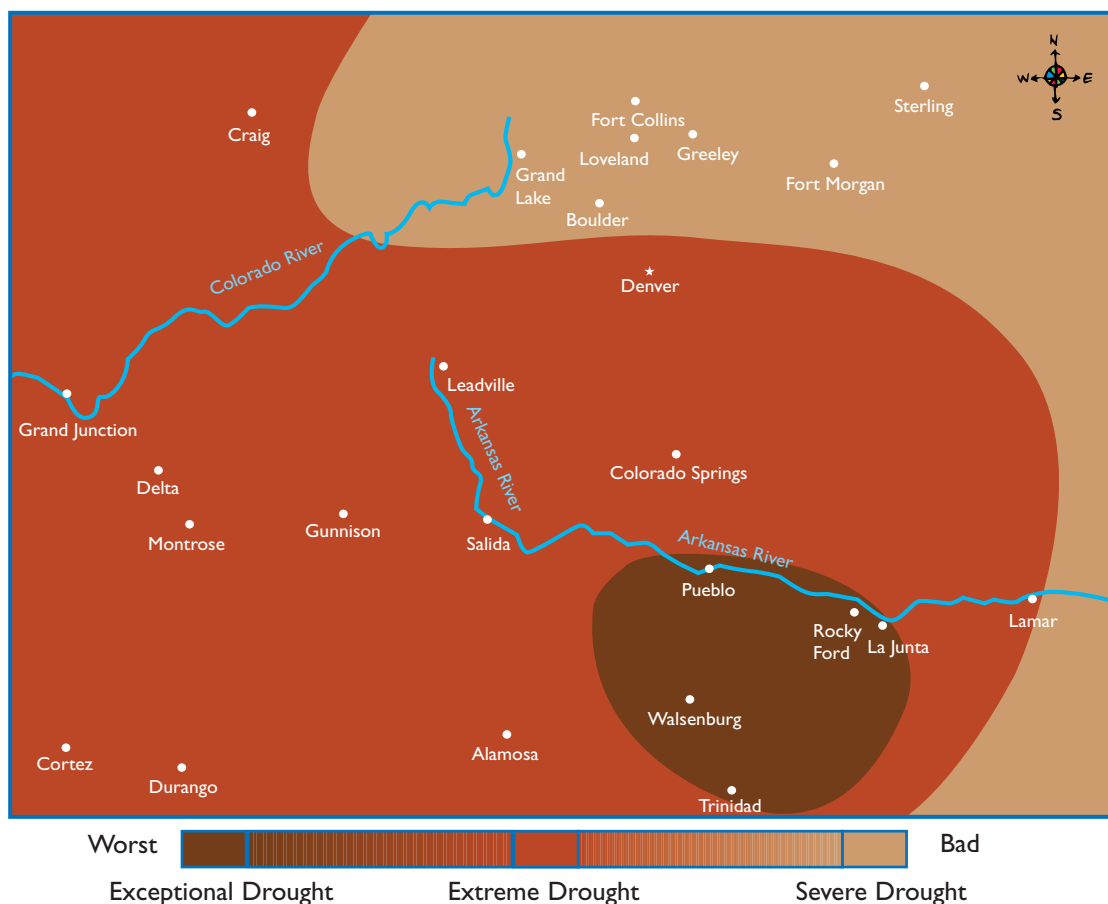
Drought doesn't just effect plants and farmers. Over time it affects everyone. This is exactly what happened to Colorado and our country during the "Dust Bowl." In the 1930s drought covered most of the Great Plains for almost 10 years. Farmers couldn't plant crops, and the wind blew dust so thick that the sky turned black. The dust clouds even reached all the way to Washington D.C. This is why it was called the Dust Bowl.

The Dust Bowl was devastating to our country. Thankfully, the drought didn't last forever. When rain and snowfall returned conditions got better. Since then, we've made improvements in farming and controlling erosion of our soil from wind.

The current drought has caused us to use water rationing. This means everyone uses no more than a set amount of water. Many towns and cities practice water conservation. The cities and towns themselves use less water and encourage residents to take steps to use less water. With everyone's help we can protect our valuable water and lessen the effects of drought.

Colorado Drought Map for November 2002

from the U.S. Drought Monitor at <http://www.drought.unl.edu/dm/monitor.htm>



Tree Rings

Trees are amazing! Sometimes they can survive fire and drought and can grow to be hundreds or even thousands of years old.

Did you know trees keep a record of wet and dry years inside their trunks? Every year trees grow a new layer or ring of wood. In wet or rainy years the layer will be wide. In dry or drought years the layer of wood will be skinny.

Scientists can learn about droughts that took place many years ago by examining a freshly cut tree stump and counting and measuring the tree rings.

Using this research, they can find out when droughts have occurred in the past and predict how often they may occur in the future. Researchers have discovered that there was a major drought in the plains of eastern Colorado from 1845-1856. They believe that this drought may have played a part in the loss of bison herds.

Tree rings can also tell scientists when fires occurred by scars in the tree rings. If the tree didn't die but was only scarred, you can count the rings to find out when the fire happened. Pretty amazing!

FUN FACT

- One large tree can provide a day's oxygen for four people.
- Americans use enough firewood each year to build a 100 foot stack of wood stretching from New York City to San Francisco!

Messages In The Tree Rings



Melody planted this tree in 1989

1. What year was the tree cut down?

2. What year was the worst drought year?

3. In what two years did a fire leave a scar on the tree?

4. What year was the wettest year?

Answer the questions by counting the tree rings. The tree is giving us clues by the size and shape of the rings.

