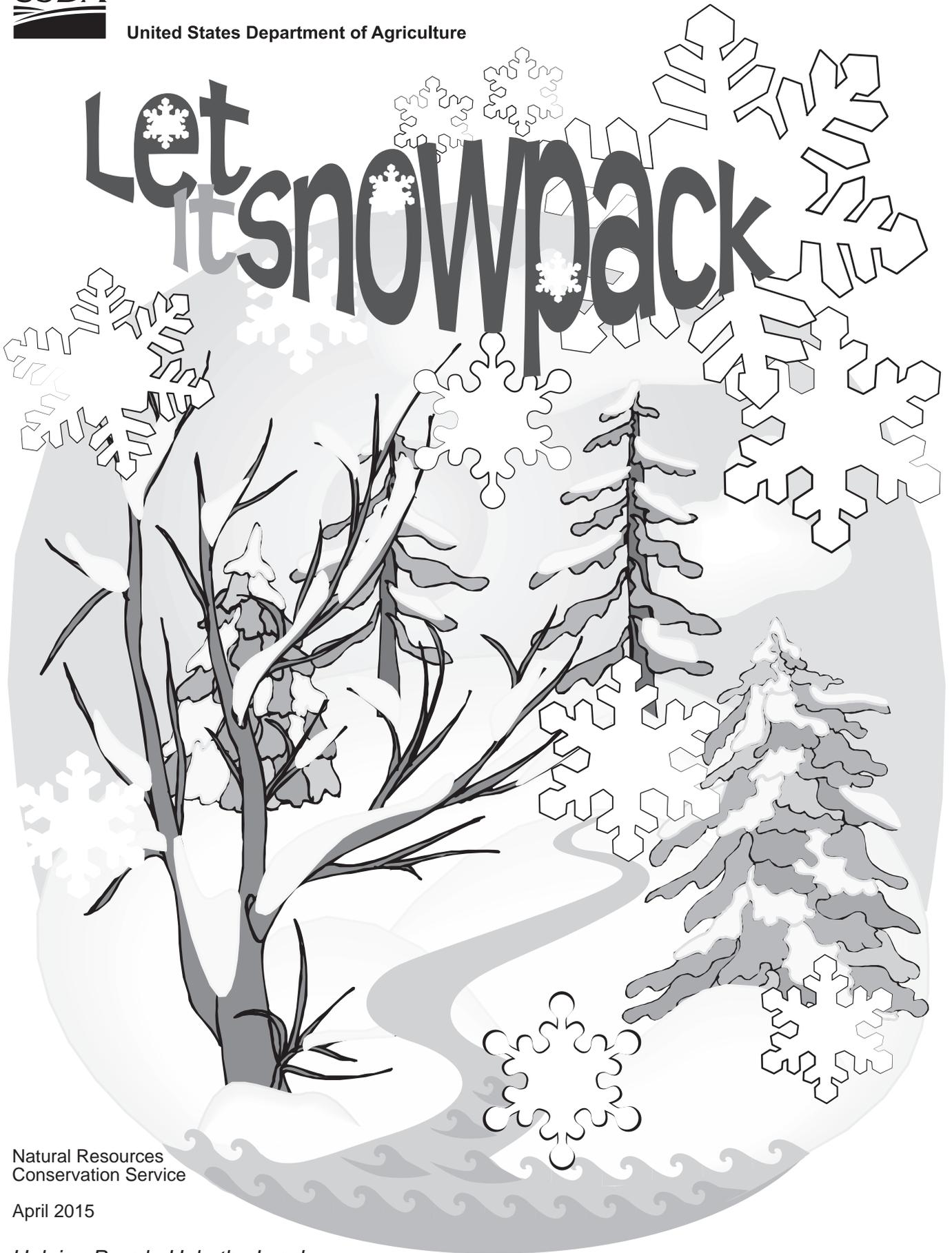




United States Department of Agriculture

Let It snowpack

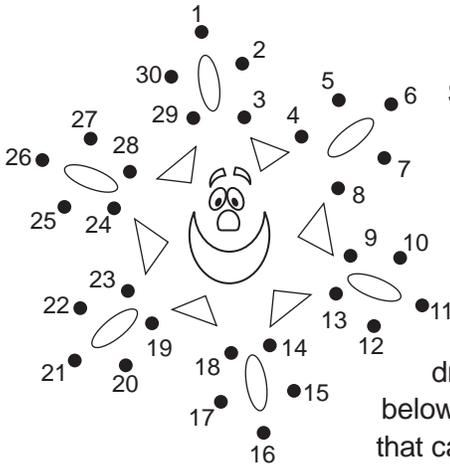


Natural Resources
Conservation Service

April 2015

Helping People Help the Land

What is Snow?



Snow is a form of precipitation. It falls to earth as a condensed form of water. The most common types of precipitation are: rain, snow, hail and sleet.

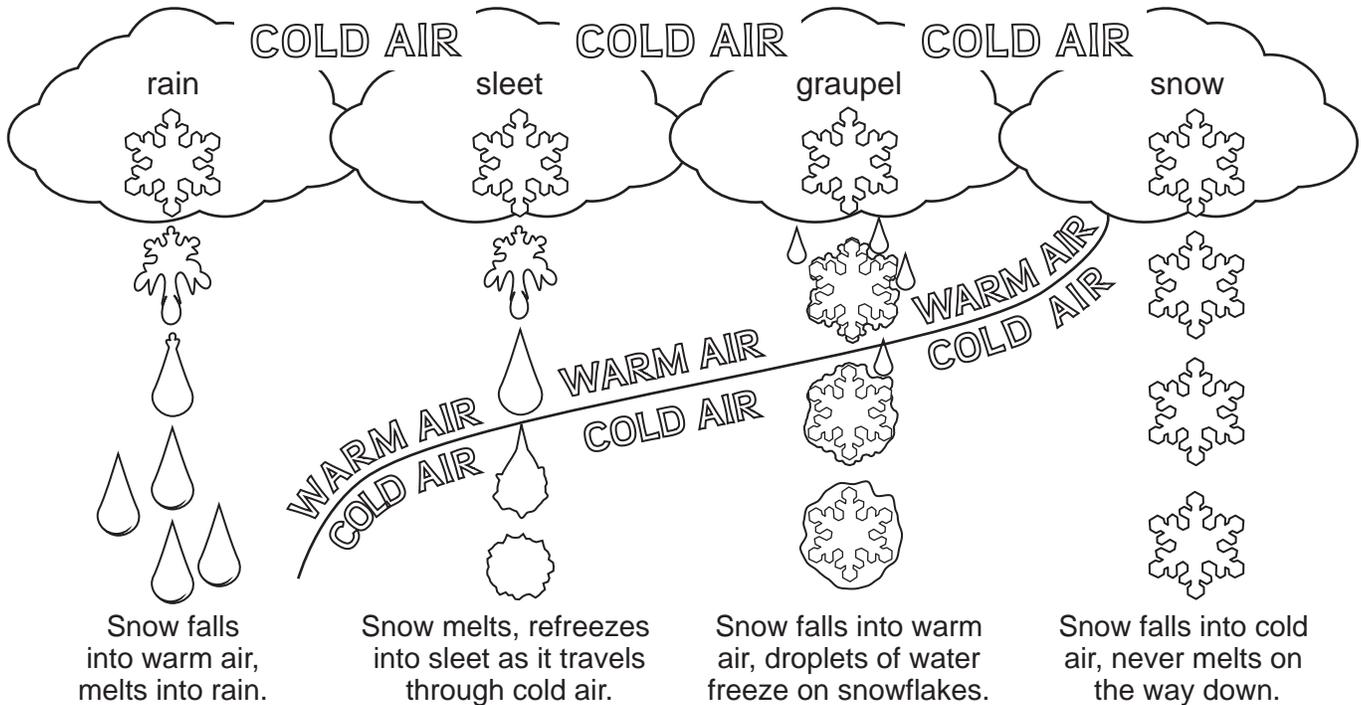
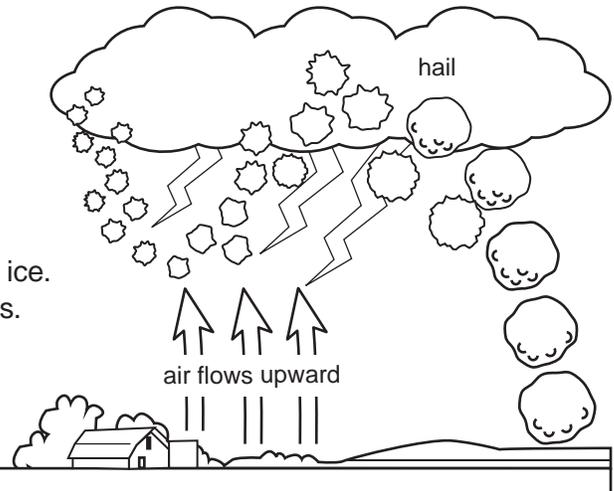
Water turns into snow through a process called condensation. Condensation occurs when a vapor or gas converts to a liquid. When the temperature in the air is cool enough, the water vapor changes into tiny droplets of water. Once water vapor condenses into water, the droplets of water form clouds. When the temperature in the clouds is at or below 32 degrees Fahrenheit, the droplets of water freeze into tiny ice crystals that can fall as snow.

Snow is not the only type of ice that falls from the sky. Other forms of icy precipitation are:

Hail. Forms when a frozen raindrop or graupel is kept from falling to the ground by air flowing upward in a thunderstorm. The more droplets that freeze onto the hailstone, the longer the hailstone spends in the sky. When it finally grows too heavy to be held up by the flowing air, hail falls to the ground.

Graupel. Snowflakes that have become encrusted with ice. This happens when droplets of water freeze on snowflakes.

Sleet. Drops of rain or drizzle that freeze into ice as they fall.

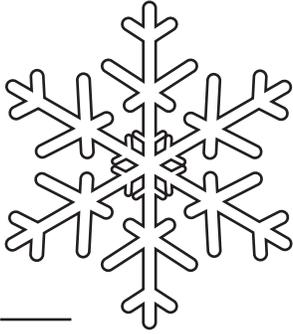


The Shapes of Snow

Snow falls in many different crystal shapes. The global classification for snow crystals, ice crystals and solid precipitation is divided into several levels: general, intermediate and elementary. The general level has eight categories. Intermediate has 39 categories, and the elementary level has 121 categories!

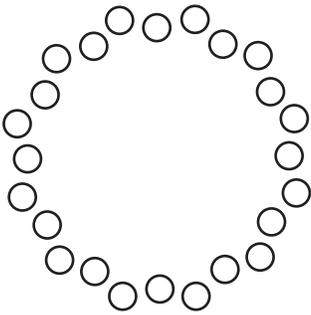
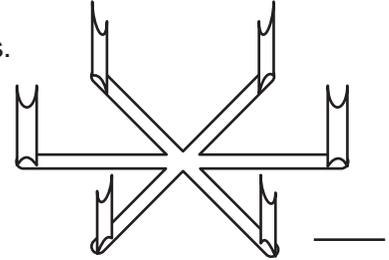
Eight General Level Categories

Next to each example picture, write in the letter for the category (group) to which it belongs.

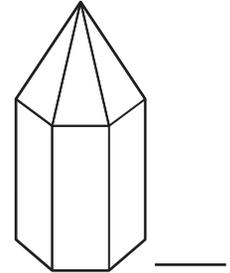


Column crystal group (C)
Includes snow crystals that look similar to columns.
EXAMPLE: bullet-type crystal.

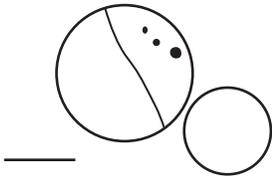
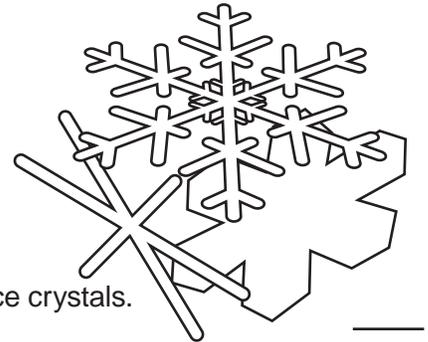
Plane crystal group (P)
Snow crystals that are shaped similar to a hexagonal (six-sided) plate.
EXAMPLE: dendrite-type crystal. Dendrites, or branching extensions, make this type of plane crystal look like the typical snowflake.



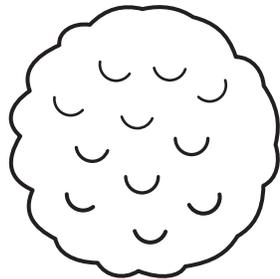
Combination of column and plane crystals group (CP)
Snow crystals made of columns and planes.
EXAMPLE: six-pointed plane crystal with needle-type column crystals at the tip of each point.



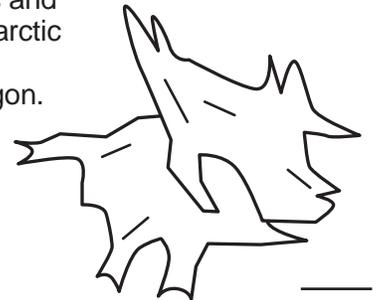
Aggregation of snow crystals groups (A)
Snow crystals that come together to form a whole cluster of snow crystals.
EXAMPLE: aggregation of three different plane-type crystals.



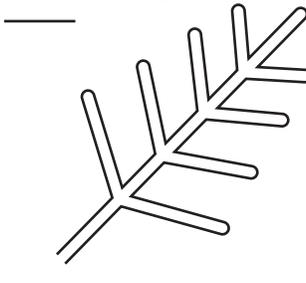
Rimed snow crystal group (R)
crystals that are coated with tiny ice crystals.
EXAMPLE: graupel. Looks like a circle of tiny ice crystals.



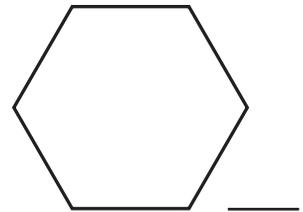
Germ of ice crystal group (G)
middle ice crystals that are less than 0.1 millimeters and often fall between the tropics and the Arctic and Antarctic polar regions.
EXAMPLE: plane-type ice crystal is a simple hexagon.



Irregular snow particle group (I)
are raised from snow cover by strong winds. This type of ice crystal is very rare in nature.
EXAMPLE: broken snow particle.



Other solid precipitation group (H)
solid precipitation particles that are not snow crystals or ice. Three types from this group are shown on this page.
EXAMPLE 1: sleet particles (H2) have uneven shapes.
EXAMPLE 2: ice particles (H3) are round.
EXAMPLE 3: hailstones (H4) are round and bumpy.

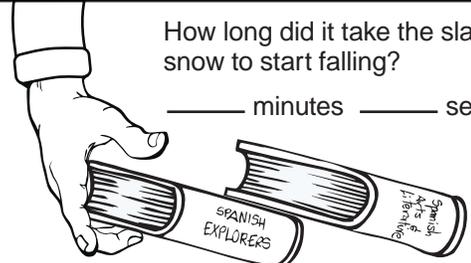
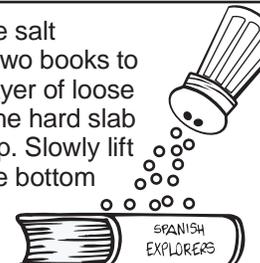
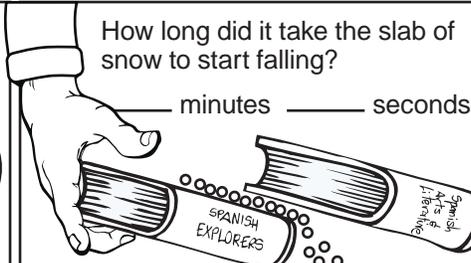
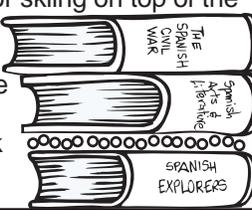
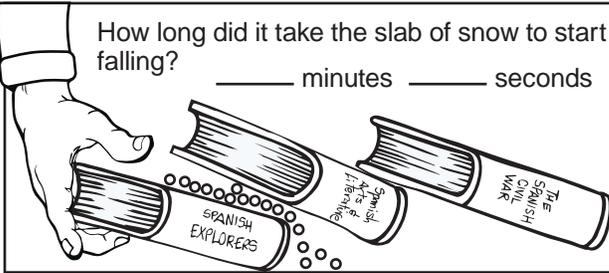


Snowpack and Its Layers

As snow and ice fall to the ground, they build layers of snow called snowpack. Snowpack is the total amount of snow and ice on the ground. In high mountain ranges, snowpack builds up in the winter and melts in the spring and summer.

Layers within a snowpack vary and constantly change due to temperature changes in the air and within the snowpack. Some layers are weak, while other are strong. When the weak layers prevent the strong layers from sticking together, the strong layers slide over the weak layers. When snow begins to glide down a mountain, it is called an avalanche.

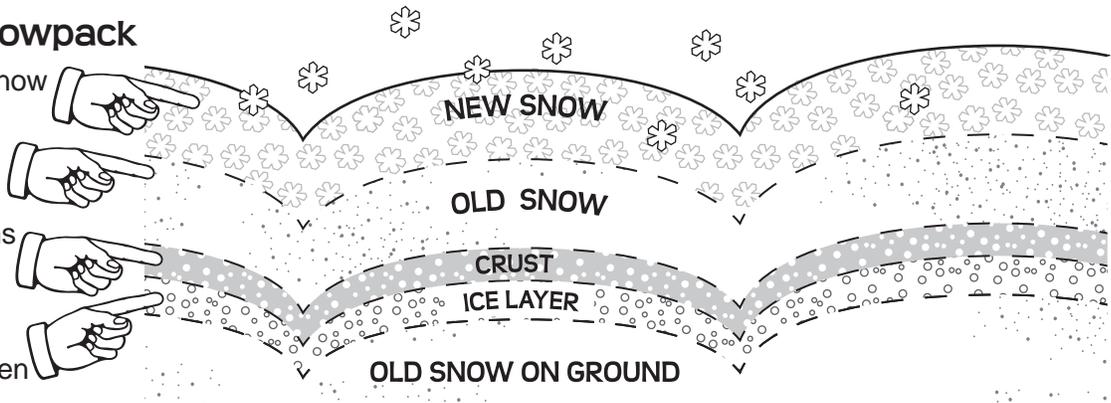
Create your own avalanche

<p>Phase 1</p>	<p>Put two books on the floor, one on top of the other, to represent the ground and a slab of snow. Slowly lift one end of the bottom book off the floor.</p> 	<p>How long did it take the slab of snow to start falling?</p> <p>_____ minutes _____ seconds</p> 
<p>Phase 2</p>	<p>Sprinkle some salt between the two books to represent a layer of loose snow below the hard slab of snow on top. Slowly lift one end of the bottom book off the floor.</p> 	<p>How long did it take the slab of snow to start falling?</p> <p>_____ minutes _____ seconds</p> 
<p>Phase 3</p>	<p>Add a third book above the top book to represent people hiking or skiing on top of the snow. Sprinkle salt between the bottom book (ground) and middle book (snow) but not between the middle book and top book (people).</p> 	<p>How long did it take the slab of snow to start falling?</p> <p>_____ minutes _____ seconds</p> 

What does this experiment tell us about how some types of snowpacks are more likely to cause an avalanche than others?

Layers of snowpack

- the most recent snow
- snow that has accumulated and compacted
- hard layer contains more water than normal snow
- snow that has melted and refrozen



Measuring Snowpack

In 1935, the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) established a Snow Survey and Water Supply Forecasting Program. There are more than 1,200 manually-measured snow courses and over 750 automated Snowpack Telemetry (SNOTEL) weather stations in 13 Western states, including Alaska. Since 50 to 80 percent of the water supply in the West arrives as snow, data on the snowpack provides information to decision makers and water managers throughout the West.

What's at a SNOTEL site?

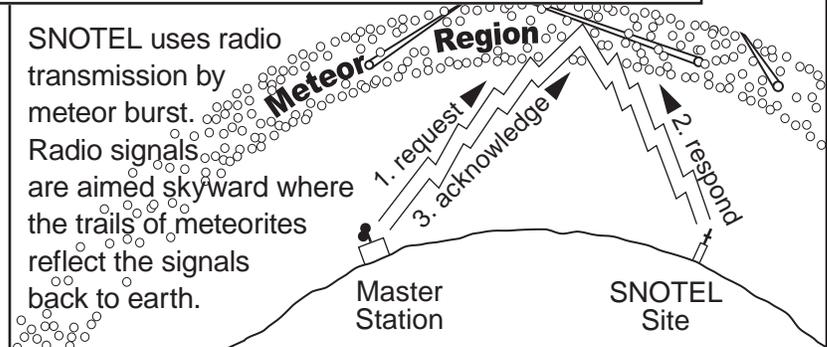
Use the alphabet key to fill in the boxes with the correct letters.

- A = 1
- C = 2
- D = 3
- E = 4
- G = 5
- H = 6
- I = 7
- K = 8
- L = 9
- M = 10
- N = 11
- O = 12
- P = 13
- R = 14
- S = 15
- T = 16
- U = 17
- W = 18

15 12 9 1 14
13 1 11 4 9
1 11 16 4 11 11 1
16 4 10 13 4 14 1 16 17 14 4
15 4 11 15 12 14
15 11 12 16 4 9
15 6 4 9 16 4 14
15 11 12 18
13 7 9 9 12 18
13 14 4 2 7 13 7 16 1 16 7 12 11
5 1 17 5 4
15 11 12 18
3 4 13 16 6
15 4 11 15 12 14
5 14 12 17 11 3 16 14 17 16 6 10 1 14 8 4 14

Ice and Water

1. Gather snow (or ice from the freezer.)
2. Put it in a measuring cup.
3. Record the measurement of the ice.
ice: _____
4. Let it melt. Then record how much water is in the measuring cup.
water: _____



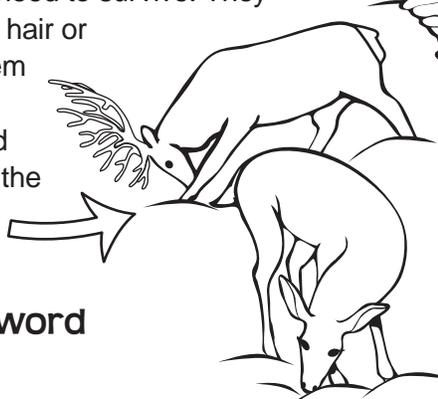


Snow, Plants and Animals

In regions that receive a lot of snow, plants and animals have adapted to the snowy conditions. Plants, unlike animals, cannot escape harsh winter conditions. Plants have to stay put. Some plants are deciduous. They drop their leaves for part of the year and are able to save water since leaves tend to evaporate water into the air. Evergreen plants keep their leaves. Evergreen leaves and needles have thick, waxy coatings, helping reduce water loss. For places that receive more frequent snow, plants hold on to dead leaves for insulation or use deep snow like a blanket to protect against the cold.

However, animals' survival is a bit different from plants. Since animals are not rooted to the ground, they have a few more options. Animals can:

Adapt. Some animals have adapted to coexist with the cold. When it comes to adaptations, grazing animals use their hooves and muzzles to clear snow away from plants they need to survive. They also grow thicker hair or coats to keep them warm during the winter. They shed their coats when the weather is warm.



Hibernate. Some animals, like bears and marmots, build a protective burrow and go into a deep, long sleep. The process is called hibernation. Hibernating animals build up fat reserves in the fall so they can survive during the winter months, usually not waking until spring.



Migrate. Some animals leave the cold, snowy regions during the winter.

Snow Crossword

Across

- 1. Cold precipitation
- 4. Leave cold regions in the winter
- 6. Six-sided polygon
- 8. Snowpack Telemetry
- 10. Water falling to earth
- 11. Snow begins to glide down a mountain
- 13. Plants that drop their leaves for part of the year
- 14. Warm precipitation
- 16. Drops of rain that freeze into ice as they fall

Down

- 2. Snowy season
- 3. Go into a deep, long winter sleep
- 5. A gas becomes a liquid
- 7. Change to survive
- 9. Total amount of snow and ice on the ground
- 12. Snowflakes encrusted with ice
- 15. North polar region

Snow and People

Snow is essential to humans. Many cities rely on melted snow to replenish their water supplies. By measuring the snowpack, NRCS is able to give water managers estimates of how much water will be available from the snowmelt.

Agricultural producers also depend on snowmelt for their water needs. In Western states, many producers depend on diverted or stored water supply for irrigation. By using data from NRCS, landowners are able to make decisions about how much water will be available to water their crops. This helps them determine how much food they will be able to produce for the year.

While snow is critical to our water and food supply, it is also a source of fun for those who like the outdoors. For more than 5,000 years, people have traveled long distances across snowy and icy landscapes. Ice skates, skis, sleds and snowshoes were invented to help travelers stay warm and travel quickly. In the Western states, many people use these tools for recreational activities.

Make Your own Snowshoes

Before you begin to design and make your snowshoes, think about these two important factors:

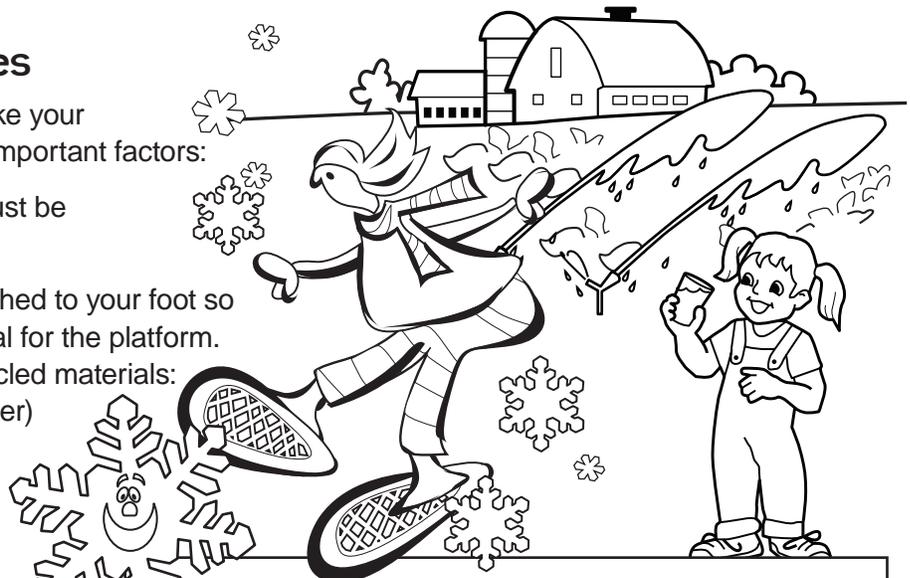
1. The platform of the snowshoe must be much larger than your foot.
2. The platform must be firmly attached to your foot so it will not fall off. Choose the material for the platform. It could be any of the following recycled materials:

- Shoe boxes (the bigger, the better)
- Cardboard
- Gallon-sized plastic milk jugs

Choose the material for attaching the platform to your foot. Choose one of the following:

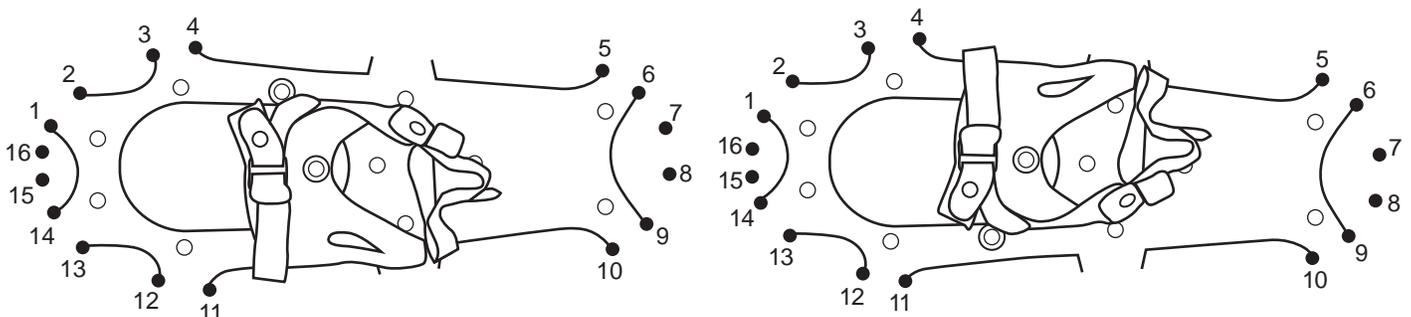
- Long shoelaces (or several shoelaces tied together)
- Large, thick rubber bands

Strap the platform to your boot just before you are ready to go outside. Be careful when you walk. Lift your foot up high, just as if you were wearing flippers. You don't want to trip over your big, snowshoed feet!



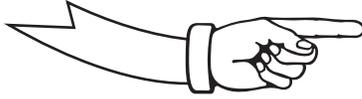
You Don't Need Snow for Snowshoes

You can make snowshoeing a fun activity wherever you live. Some kids like to snowshoe on soft surfaces, such as thick grass or pine needles. Kids at the beach enjoy snowshoeing through soft sand or over dunes. The main difference between these surfaces and the snow surface is their roughness. To protect the bottoms of their snowshoes from too much wear, these kids often put duct tape on the bottom of their snowshoes.

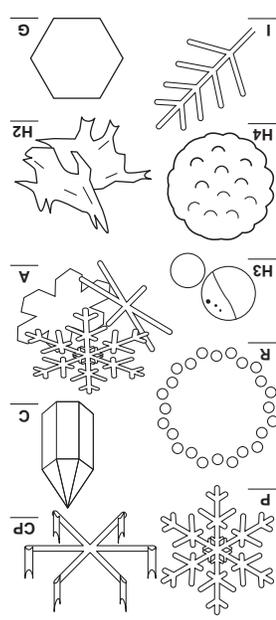
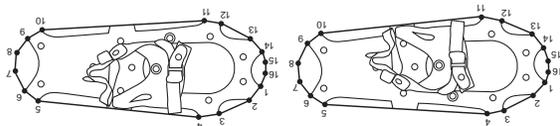
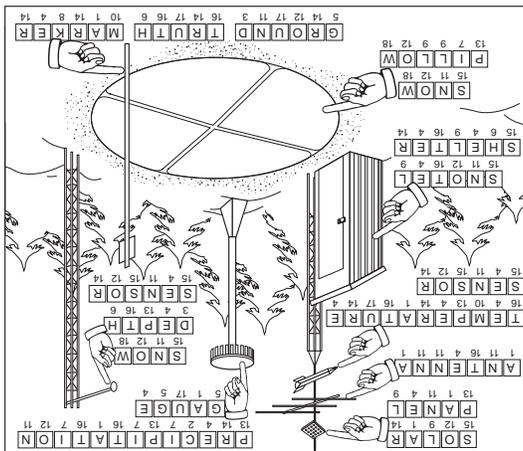
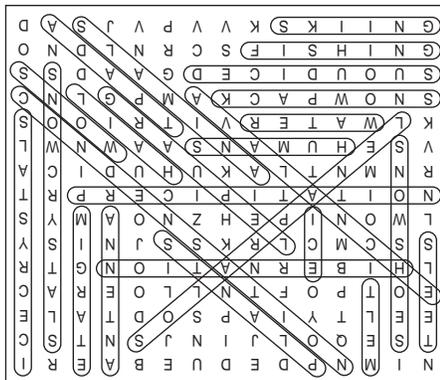


Snow Word Search

Circle all the words from this list that you can find. Hint: some are spelled backwards.



- ADAPT
- ANIMALS
- ANTENNA
- AVALANCHE
- CONDENSATION
- DECIDUOUS
- FISHING
- GRAUPEL
- HAIL
- HIBERNATION
- HUMANS
- ICE
- ICECRYSTALS
- MELT
- MIGRATE
- PLANTS
- PRECIPITATION
- SKIING
- SLEET
- SNOW
- SNOWCRYSTALS
- SNOWPACK
- SNOWSHOES
- SOLARPANEL
- WATER



ANSWER KEY

