



Welcome to our e-Newsletter!

We hope you enjoy SJMA's newsletter created solely for educators - whether you teach in the classroom or outdoors, this newsletter is for you! In each monthly issue, you will receive helpful information on natural and cultural resources found in the Four Corners area, as well as field and classroom activities to do with your students.

The San Juan Mountains Association is the educational nonprofit partner for San Juan National Forest and Bureau of Land Management. If you received this newsletter and do not wish to continue receiving it, send an "unsubscribe teacher newsletter" email to gabi@sjma.org. If a friend or colleague sees this newsletter and is interested in receiving it, please have them send an email to gabi@sjma.org.

Falling Leaves

What's Happening to the Trees?

As almost anyone can see, autumn is a beautiful time to be in the mountains, on public lands. The reds, yellows, and oranges we see in a land where we're used to seeing greens and browns can be breathtaking. What are the environmental cues that are making this yearly phenomenon happen? And where does this color come from?

Why do Trees Lose Their Leaves?

In the Northern Hemisphere, autumn is generally known to occur during September, October and November. Our signals include fewer daylight hours and falling temperatures, not to mention other environmental cues such as birds migrating south or to lower elevations, our gardens finishing up their harvest, and of course, the changing colors and eventual drop-off of the leaves.

Why do trees lose their leaves every year? Doesn't it take a lot of energy to make new leaves every spring? In fact, it takes plenty of energy for trees not to lose their leaves every year. Of course, some trees already do this – coniferous, or evergreen trees. Examples of these trees in our area include pines, spruce and firs. Coniferous tree leaves, also sometimes called needles (depending on the tree), must be specially adapted to deal with even the coldest winters. One of the main ways they are adapted to this is by being tough. Their leaves are tough and strong, as well as have many chemicals in them that aren't very tasty to insects. Therefore they can 'afford' not to lose their leaves every year.

Deciduous trees that do lose their leaves every year do this for some very good reasons. For one, their leaves are just not adapted to survive the freezing temperatures of winter – they are much too delicate for that. Another reason is that by dropping their leaves they are getting rid of leaf-eating insects and their eggs and larvae. In fact, producing new leaves every spring is relatively 'cheap' for trees to do, considering what they get in return – the trees get to lose the old leaves that may have been damaged by weather, disease and insects, and are able to produce fresh, new leaves that can make food for the tree via photosynthesis.

What is it that makes the leaves drop? Tree trunks, branches and twigs can survive the winter, but delicate leaves aren't so lucky. At the end of summer, the leaves are filled with sugar. At the base of each leaf is something called a *separation layer*. In the fall, the cells in this layer start to fill up with a cork-like substance, trapping the sugar in the leaves. Once this happens, water also cannot get to the leaves. The combination of this and the lack of sunlight makes the chlorophyll start to break down. Eventually the leaves fall from the trees, breaking off at this separation layer. Oak leaves are one exception to this, however. In oak leaves the separation layer never fully 'separates' the leaves from the twigs, and the leaves often stay on the tree all winter.

The Color of Things

For a good portion of the year, trees in our area are green. The green pigment in the cells of the leaves is *chlorophyll*. This chlorophyll is what allows the trees to be able to make food for the tree in the form of sugar. As the days get shorter, daylight is diminished and there is not enough light for photosynthesis to occur. The chlorophyll that was already in the leaves then begins to break down, and additional chlorophyll is no longer being produced, making the green fade from the leaves. Through the winter, trees rest from their food-making processes and live off the food that has been stored in the twigs and branches throughout the summer.

As the green fades from the leaves, orange and yellow appears. These pigments, called *carotenoids*, were actually always present in the leaves – we just couldn't see them before because they were covered up by the green chlorophyll. *Anthocyanins* are the pigments that cause us to see red leaves. Anthocyanins are actually only made in the fall. This occurs because sugars are trapped in the leaves after photosynthesis stops. Not all trees make anthocyanins. It's not clear why some trees do expend the energy to make anthocyanins. Some scientists believe it's because it allows the trees to keep their leaves a little longer, allowing the nutrients in the leaves to go back into the tree for longer. Others think it's because after the leaves fall on the ground and decay, it prevents other plants from growing and competing with the tree. The brown color that some leaves turn to is a result of wastes that are left in the leaves after the chlorophyll is gone.

It is speculated that the best fall colors appear when the spring has been wet, summer has been dry, and autumn has bright, sunny days and cool nights.

Classroom Activity – Autumn's Artistic Side

Topic: Autumn can inspire your students' artistic sides.

Preparation: Varies

Materials: Varies

Procedure: Autumn is such a beautiful, colorful time of year – it's a perfect time to get in touch with your and your students' artistic sides. Here are a few possible activities to have your students use the right side of their brains:

1 Create a leaf scrapbook/field guide – go over the various species of trees found in our area (see information in field activity below). Have students collect leaves, then press them between newspaper in the pages of a heavy book. Leaves should be pressed for several days. Next, have them mount the leaves on heavy-duty paper using glue, putting the following information on the paper: name of tree that the leaf came from, name of collector, when and where collected. Assemble these pages together into a book-like form.

2 Make an autumn poem – There are many ways to write poems.

- You can use the following poem as an example to get your students thinking about poetry:

Autumn by Emily Dickinson

The morns are meeker than they were,
The nuts are getting brown;
The berry's cheek is plumper,

The rose is out of town.
The maple wears a gayer scarf,
The field a scarlet gown.
Lest I should be old-fashioned,
I'll put a trinket on.

- Your students can make an *acrostic* poem, using fall words such as: fall, autumn, leaf, etc. An acrostic poem uses the letters in a topic word to begin each line. All lines of the poem usually relate to the topic word.
- Another option is *haiku*, where the poem is 3 lines long, and the lines have 5, 7, and 5 syllables, respectively, and it does not rhyme.
- *Cinquain* poems have 5 lines, and follow the following structure: line 1 – title, line 2 – description of the title, line 3 – some action about the title, line 4 – feeling about the title, line 5 – synonym for the title.

Have your students write their poem on a cutout shape of a leaf and display them in your classroom.

· Leaf rubbings – Place a leaf, or several leaves rough side up on a table, then place a thin piece of paper on top of that. Use colored pencils or crayons and rub these over the leaves to create an impression on the paper. These colored ‘leaves’ can be used for many purposes – they can be made into greeting cards; they can be cut out and made into an autumn wreath... the possibilities are endless. You can assess your students’ knowledge (assuming you’ve gone over the background information above) by having students explain why their paper leaves are those colors.

Field Activity – Leaf Races

Topic: This activity introduces students to the deciduous and coniferous trees, and their leaves, found in our area.

Preparation: Students will be part of the preparation for this activity – they will collect leaves in the beginning of the activity for use later in the activity.

Materials: Leaves and needles from different trees in the area – as many different kinds as you can find; tree identification books, if available.

Procedure: Using the background information found above, discuss autumn and the changing of the leaves with your students. Vary the complexity of this discussion depending on the age of your students.

Next, discuss the different tree species found in our area, and ways to identify them. Here’s a short, non-exhaustive list to get you started:

1 Aspen – probably the most identifiable of the trees in our area. Bark is white, and leaves are semi-rounded at one end, coming to a point at the other end. It is a deciduous tree, losing its leaves every fall. You might drive into the mountains to take a peep at the beautiful gold colors the leaves of this tree turns in the fall.

2 Ponderosa pine – a coniferous tree, the ponderosa can be gigantic – up to 140 ft tall, and 4 ft in diameter. Its bark smells like vanilla, and its needles are 5 - 8" long, are bundled two or more together, and are thin and pointy.

3 Piñon pine – grow 30-45 ft tall and 3 ft in diameter. They can live to be 800 years old! This species is found at lower elevations. Needles are about 2" long or shorter, and are in bundles of 2. Piñons are evergreen trees, not losing their needles in the fall.

4 Utah and Rocky Mountain Juniper – two more coniferous trees found at lower elevations, usually with piñon trees. One obvious characteristic of both types of juniper are the blue berries with which they

reproduce. These berries are an important food source for wildlife in the area. Junipers can live for hundreds and hundreds of years.

5 Gambel oak – are found between 6,000-9,000 feet in elevation, and are extremely common. In the fall you will see this tree in various colors of orange, red, and yellow. They produce many acorns that are readily eaten by wildlife such as squirrels, deer and turkey. This species can be either short, or up to 35 ft tall, depending on the water source.

For more examples of tree species in our area, visit www.swcoloradowildflowers.com.

To do the activity – Take your students to an area with a diversity of leaves, or have them find leaves at home to bring into class. They can find leaves that are green, or another fall color. They can also collect short branches from coniferous trees. Discuss the similarities and differences among the leaves as well as the names of the trees from which the leaves came. As a wrap up to this discussion, play the following game:

- 1 Divide your class into 2 teams. Have each team line up across from each other, facing each other, at least 40 feet apart.
- 2 Have teams count off, so each person has a number.
- 3 The leader names a tree, waits a few seconds, then calls out a number, such as number five. The number 5's from each team run to the middle, try to pick up the correct leaf first, then run back to their line without being tagged by the other number 5 who hadn't picked up the leaf first.
- 4 You can vary this activity to include other information, such as, "pick up the leaf showing the most anthocyanins" for older students, or simply, "pick up the red leaf" for younger students.
- 5 If you wish to keep score, you can do so the following way: teams get 1 point for grabbing the correct leaf, 1 point for making it home without being tagged, and one point for the team that tags the player with the leaf. You can also use negative points to discourage random guesses.

Extend the Experience

There are a million places you can go to find beautiful fall leaves, from your own backyard to the backcountry. But remember, the higher in elevation you go, the sooner those colors will be gone! Here are just a few suggestions for places to check out autumn's splendor:

- 1 LaPlata Canyon and Hesperus near Durango
- 2 Silverton to Molas Pass on Colorado Hwy 550 north of Durango
- 3 Transfer Campground northeast of Mancos
- 4 Lizard Head Pass northeast of Dolores

More information:

1 You can also find tree activities in the Forest Keepers Activity book, a free workbook for children found at any of the San Juan Public Lands offices in the area. Forest Keepers includes a tree identification dichotomous key geared to ages 10 and up. For a classroom set of Forest Keepers, please contact Gabi Morey at gabi@sjma.org or [970-385-1256](tel:970-385-1256).

2 Fall foliage report on the San Juan National Forest - http://www.fs.fed.us/r2/recreation/fallcolors/report/report_2006/sanjuan/index.shtml

3 Forest Service Fall Foliage Hotline - [1-800-354-4595](tel:1-800-354-4595), or [970-264-2268](tel:970-264-2268) for the Pagosa Ranger District

4 Colorado State Parks fall color trip ideas - <http://www.parks.state.co.us/Fall/>

5 Scientific basics of autumn color: <http://ncnatural.com/wildflwr/fall/science.html>

6 More fall activities than you can shake a stick at!: <http://www.theholidayzone.com/autumn/index.html>

Many local communities celebrate fall with festivals. Enjoy!

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San Juan Mountains Association has been around since 1988. For 15 years, SJMA has been establishing a legacy of caring for the land. Side by side with the San Juan Public Lands Center, our members and volunteers, we are helping to ensure the survival of Southwest Colorado's natural glories for generations to come. SJMA also offers classroom visits, naturalist walks and talks, teacher for-credit workshops, and field trips to public lands. For more information, visit our website at www.sjma.org, or call [970-385-1256](tel:970-385-1256).