Native Dyes

[Great Sand Dunes National Park and Preserve](http://www.nps.gov/grsa/index.htm)

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**GRADE LEVEL:**

Third Grade-Sixth Grade

**SUBJECT:**

American Indian History and Culture, Anthropology, Art, Biology: Plants, Botany, History

**DURATION:**

30 minutes

**GROUP SIZE:**

Up to 24 (4-8 breakout groups)

**SETTING:**

indoors

**NATIONAL/STATE STANDARDS:**

Colorado Science:   
5th grade 3.1  
Social Studies:   
3rd grade 1.2; 4th grade 1.2, 2.2

**KEYWORDS:**

dye, native plant

**Overview**

Students will become familiar with natural dyes, which plants they came from, and how Native Americans have used them.

**Objective(s)**

Students will become familiar with natural dyes, which plants they came from, and how Native Americans have used them.

**Background**

Before the advent of synthetic dyes in the mid-1850s, only dyes from naturally-occurring substances were available to those who colored textiles, yarn, baskets, or other materials.

There are two primary types of natural pigments used in dyeing: fat-soluble and water-soluble pigments. Fat-soluble pigments such as chlorophyll or carotenoids occur in all plants to varying degrees. Chlorophyll will produce a green to olive-green color and carotenoids (such as in orange carrots) produce yellow to red pigments. A great range of water-soluble flavinoids also give color and function to many flowers, fruits, and vegetables. Examples of flavinoid pigments are the pink-purple found in beets and the yellow found in onion skins. The red to blue anthocyanin is a flavinoid found in many plants. Among its other functions, anthocyanin helps to protect some plants from the cell-destroying effects of UV radiation.

As a rule, natural dyes are extracted from plants by pounding, shredding, or cutting them up. Plant parts are then placed in water and heated to a temperature just below the boiling point until the color has transferred into the water. When the color is added to a mordant-saturated material, the dye will then adhere to the fiber of the material. Mordants help set colors permanently into fibers.

Since many mordants are very toxic, it is recommended that you use aluminum ammonium sulfate with students. This form of alum is commonly used as a pickling agent. Native Americans used a number of naturally-occurring mordants which include\*\*: natural alum precipitated from some drying soils, tannic acid from sumac (berries, branches, or leaves), lye made from wood ashes, urine, a sheep manure and water mixture, and smoke.

When thinking of collecting natural materials for the dyes, remember that the plants at Great Sand Dunes National Park are protected. If you collect plants from the wild, make sure you do so from legal areas. Alternatively, use plants from the grocery store. Some of the base plants can be pointed out on a field trip but not gathered. Below is a list of plants that can be used for dyeing, some of which have been used for centuries by Native Americans.

|  |  |  |
| --- | --- | --- |
| **Plant** | **Dye Color** | **Plant Part** |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| *From the Wild* |  |  |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Rocky Mountain Bee Plant | black | boiled leaves |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Rubber Rabbitbrush | yellow | flowers |
|  | green | inner bark |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Prairie Sunflower | yellow | flowers |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Wild Red Raspberry | pink | berries |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Dandelion | yellow | flowers |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Rocky Mountain Juniper | purple | roots |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Sage (*Artemisia* sp.) | yellow-green | whole plant |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Mullein | moss-green | leaves, flower |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
|  |  |  |
| *From the Store* |  |  |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Onion | light yellow | skins |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Blueberry | purple | berry |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Sunflower Plant | blue | seeds |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Beets | deep pink | root |
| http://www.handsontheland.org/grsa/elements/transparent.gif | | |
| Spinach | dark olive-green | leaves |

**Materials**

Natural materials (see list in Background), water, boiling pots, hot plate or stove, alum, cream of tartar, kitchen scale, net bag, white cotton yarn or white cotton material, Plant Handbook (.pdf)

Many mordants are highly toxic, alum (aluminum ammonium sulfate, used in pickling) is the least toxic (recent research shows that aluminum is a toxic metal when absorbed through skin); Exercise safe behavior around hot plate and boiling water

* [**Plant Handbook**](http://www.nps.gov/grsa/forteachers/classrooms/loader.cfm?csModule=security/getfile&pageID=690448)

Common plants of the foothills and grasslands around Great Sand Dunes [Download](http://www.nps.gov/grsa/forteachers/classrooms/loader.cfm?csModule=security/getfile&pageID=690448)

**Procedure**

* [Step 1](http://www.nps.gov/grsa/learn/education/classrooms/native-dyes.htm#step1)

The amount of material needed for the dyepot varies. For four ounces of cloth or yarn, use 12 ounces of plant material, one ounce of alum, and 1/4 ounce of cream of tartar in four quarts of water. Soak skeins of white yarn or material in plain water for 24 hours before dyeing.

One-Pot Method\*

*Create Dye*  
1. Put water in a large pot, add shredded plant parts (place in net bag)  
2. Simmer 1/2 to 1 hour (just below the boiling point)  
3. Strain out material (remove net bag)

*Dye Fibers*  
4. Add alum and cream of tartar to water and stir (cream of tartar helps keep fibers soft)  
5. Put in pre-moistened fiber/yarn  
6. Simmer until material is a little darker than you desire, stirring and submerging occasionally  
7. Remove from heat

*Remove Fibers from Bath and Dry*   
8. Rinse (starting with warm water) until cool  
9. Hang to dry

Students can then create their own artwork using their own dyed yarn.

**Assessment**

Make a list of colors you can think of that are produced by plants in nature. For what purposes do plants produce colors? Why do humans enjoy dyeing fibers?