Resources contains information available to teachers such as videotapes and books and handouts on volcanology, geology, history, plants and animals, Indian uses of plants, etc.

IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE
Lassen Volcanic National Park
Post Office Box 100
Mineral, California 96063-0100

(9/97)

RESOURCES AVAILABLE TO TEACHERS
LASSEN VOLCANIC NATIONAL PARK

1. Instructional Materials

Interpretive Leaflets for Self-Guiding Trails
Boiling Springs Lake
Bumpass Hell
Cinder Cone
Indian Ways
Lassen Peak
Lily Pond

Educational Curriculum
Biological Diversity - Grades 4-6 (10 units each dealing with a specific concept relating to biological diversity)
Volcanoes/Earth Science - Grades 2-4, 5-9

Videotape and Filmstrips
List and description of available audiovisual materials is included in education packet.

Publications and Educational Materials
A list of publications about the human and natural history of Lassen Park is included in the education packet. For further information, write to the Lassen Loomis Museum Association, P.O. Box 100, Mineral, CA 96063-0100 or telephone (530) 595-3399.

2. Summer and Winter Interpretive Programs

See schedule of activities in the summer or winter issue of the Lassen Park Guide, the park's newspaper.

3. Group Educational Programs in Lassen Park (Walks, Talks and Demonstrations)

Programs for schools and organized groups year-round on a variety of natural and cultural history topics. Advance reservations are required.

4. Winter Snowshoe Program (for Educational Groups)

Educational snowshoe walks emphasizing winter ecology and Lassen's geologic history. Also special programs on snow shelters and winter survival. Snowshoes provided by the park. Programs available December through March. Advance reservations required. Participants must be at least 8 years old. Group size limited.

5. Outreach

On a limited basis we provide onsite school presentations on physical and biological science topics. Advance reservations required.

6. Environmental Education Sites Used by Teachers in Lassen Park

Due to the closing of the road through the park in late fall and heavy snows in winter, many of the sites listed are only available between mid May and mid October. Check with the park for actual opening and closing dates of roads and sites within the park. Groups are limited in size on many park trails.

Bumpass Hell
Cinder Cone (Butte Lake)
Devastated Area
Devils Kitchen/Boiling Springs Lake (Warner Valley)
Hat Lake
Hot Rock
Juniper Lake
Lassen Peak
Lily Pond
Manzanita Lake
Nobles Emigrant Trail
Reflection Lake
Sulphur Works

Group Campsites Available in Lassen Park
Juniper Lake
Lost Creek

7. Educational Wayside Exhibits (Locations)

Devastated Area
Devils Kitchen
Hot Rock
Lassen Peak
Sulphur Works

8. Library

Lassen Park has a 400+ volume library containing books and technical papers on the human and natural history subjects of Lassen Park and the surrounding region, interpretation, environmental education, resource management, National Park Service history and other national parks. Use of the library is available by appointment only.

9. Professional Resource Managers

We have a full-time staff of professional resource managers that would be happy to answer questions or assist teachers with information regarding Lassen Park resource management issues.

10. Educational Expertise

The educational branch of Lassen Volcanic National Park is part of the Division of Interpretation and Resources Management. The staff is made up of trained professional park ranger/naturalists competent to teach and share information about Lassen Park and its related natural and human history. Our naturalists pride themselves in their ability to work with people of all ages in a variety of indoor and outdoor settings. Lassen Park naturalists are dedicated to providing high quality educational services to you, the park visitor, through a variety of creative, interpretive methods and techniques. Feel free to contact Education Coordinator Steve Zachary by writing to Lassen Volcanic National Park, P.O. Box 100, Mineral, California 96063-0100 or by telephoning (530) 595-4444 extension 5132 or 5133.

11. National Education and Information Networking

The Division of Interpretation at Lassen Park has access to a wealth of people and resources pertaining to the human and natural history of America through communication and cooperation with the 369 units of the National Park System. This includes national parks, national monuments, national historic sites, national recreation areas and other units under the management of the National Park Service, Department of the Interior.

12. General Park Information

May be requested by writing to Lassen Volcanic National Park, P.O. Box 100, Mineral, California 96063-0100 or by calling (530) 595-4444 extension 5134 or 5133.

IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE
Lassen Volcanic National Park
Post Office Box 100
Mineral, California 96063-0100
(530) 595-4444 ext. 5133

VIDEOTAPES AND FILMSTRIPS

Several interpretive programs are available for free loan to schools from Lassen Park. There are two videotapes which are 12 to 14 minutes long. There are also seven filmstrips which include a script to be read by the teacher; a total of ten scripts have been prepared for various age groups, and though the title and filmstrip will be the same, the narration varies according to the grades indicated.

Programs should be requested two to three weeks in advance to allow ample time for handling and mailing, and they should be returned promptly in order to have them available for others.

VIDEOTAPES, GRADES 5 THROUGH ADULT

Lassen Volcanic National Park: Land of Renewal features information about the human and physical geography of the Lassen Park area.

Lassen Volcanic National Park: Volcanoes, Glaciers, and Fumaroles highlights the fascinating geological story of Lassen Park.

FILMSTRIPS, GRADES 1-4

1. Life of a Tree explains the life of a tree from seed through death and beyond. It describes various parts of a tree and the functions they perform; how a tree grows; how seeds are formed; and enemies and friends of trees.

2. The Story of Lassen Volcanic National Park begins with a simple explanation of how the mountains were formed. It then follows the seasons showing some highlights of the park. Pictures of trees, flowers, birds, mammals, and insects are included along with scenes in winter and park snow removal operations in spring.

3. Through the Seasons depicts seasonal plant and animal changes in Lassen Park. Starting with spring, examples include butterfly-egg-caterpillar-chrysalis, flower to fruit, bud to falling leaves of trees, nest building-egg laying-raising young, and the migratory flight of birds.

FILMSTRIPS, GRADES 5-8

4. **Through the Seasons** features the same pictures as No. 3 in Grades 1-4, but has a more technical script.

5. **Life of a Tree** features the same pictures as No. 1 in Grades 1-4, but has a more technical script.

6. **The Forest** explains the formation of a forest, step by step, from volcanic rock to mature trees, and beyond. Ecological interrelationships between plants and animals that precede and exist in a mature forest are emphasized.

7. **Story of Lassen Volcanic National Park** features the same pictures as No. 2 in Grades 1-4, but has a more technical script.

FILMSTRIPS, HIGH SCHOOL AND SOME GRADES 7-8

8. **For All People, For All Time** tells the story of the national parks from their original conception in 1870 around a campfire in Yellowstone and its establishment as the world's first national park. It includes information on the creation of additional early parks and monuments, the establishment of the National Park Service to administer these parks, and other changes up to the present time. The purposes and objectives of the Service and various types of units in the National Park System are explained.

9. **Mountains in Bloom** is a philosophical treatment of a man's role in nature, using the flowering plant life, both herbaceous and woody, of Lassen Park as a setting. Ecological aspects are emphasized rather than straight identification, and this overall approach is designed more for thought-provoking discussion than for information alone, though many plants are identified.

10. **Lassen's Landscape** explains the geological story of Lassen Park, concentrating on the last 35 million years when the Columbia Plateau was formed. The formation and destruction of old Mt. Tehama, the development of Lassen Peak, the volcanic activity of 1914-21, the Chaos Crags and Cinder Cone activity, and the sculpturing and erosive action of natural forces are described. A speculative account of Lassen's probable future landscape is proposed.

A list of publications about the human and natural history of Lassen Park can be obtained by writing to the Lassen Loomis Museum Association, Post Office Box 100, Mineral, California 96063-0100.

BOOKS AVAILABLE FROM LASSEN LOOMIS MUSEUM ASSOCIATION

Books can be purchased at Park Headquarters and at the Loomis Museum (during summer) or by mail by writing to the Lassen Loomis Museum Association, Post Office Box 100, Mineral, California 96063-0100 or by calling (530) 595-3399.

Road Guide to Lassen Volcanic National Park, Decker
Illustrated guide to the park's major natural features as seen from the park road

Trail Leaflets: Lassen Peak, Bumpass Hell, Cinder Cone, Boiling Springs Lake, Lily Pond
Leaflets to accompany the numbered markers on these popular self-guiding trails

Eruptions of Lassen Peak, Loomis
Eye-witness account of the 1914-15 eruptions with original Loomis photo

These Happy Grounds, Strong (being revised under new title)
Administrative history of Lassen Park

Lassen - His Life and Legacy, Swartzlow
Story of Peter Lassen, early California pioneer, and the Lassen Trail

Lassen's Place Names, Schulz
The origins and meanings of the place names in Lassen Park

Nobles' Emigrant Trail, Amesbury
Story of the trail discovered by William H. Nobles which played a major role in the development of Northern California

Lassen Volcanic Nature Guide, Eifert
A visual key to over 100 common animals, birds and plants of Lassen Park

A Field Guide to the Flowers of Lassen Volcanic National Park, Showers
An illustrated guide to the park's more common plants

Trees and Shrubs of Lassen Volcanic National Park, Nelson
Field guide with identification key and illustrations

Through Vulcan's Eye, Kane
An in-depth analysis of Lassen's geology

Indians of Lassen Volcanic National Park and Vicinity, Schulz
Life and customs of the Hat Creek Indians with drawings

Lassen Trails, Matteson
A brief guide to park trails with maps

Hiking Trails of Lassen, Perkins
A detailed description of the trails in Lassen

Wild Wonders of Lassen Park, Brown
A learning and activity book devoted to Lassen Park

Lassen Volcanic: Land of Renewal
An 11-minute introduction to Lassen Park and its features

Volcanoes, Glaciers and Fumaroles
A 14-minute description of the park's formation and volcanic and geothermal features

Lassen Volcanic National Park Natural History Poster, Eifert
A key and colorful poster showing park flora and fauna

Postcards
Nine different black and white views of eruption scenes with descriptions

LAVO-175(10/88) **BASIC VOLCANIC TERMS AND EXPLANATIONS**

Volcano: A volcano is a vent in the earth's crust from which molten (or partially liquid) rock or steam issues. The term volcano is also popularly applied to the volcanic structure (hill or mountain) which is usually built from the material ejected from such a vent. While in the earth's crust, molten rock is known as magma. Once it issues from the vent, both the liquid material and the solid rock it forms are known as lava.

Magma is found in pockets within the earth's crust. These are known as magma chambers. The formation of these magma chambers is probably the result of several factors. Temperatures increase with depth so that 40 miles below the earth's surface temperatures may reach 2200°F. One might expect these rocks to be liquid, but because of the great pressure which exists at this depth, they are solid or semi-solid. When a reduction in pressure such as is associated with a buckling of the earth's crust occurs, then these rocks can liquefy. Liquefaction may also be brought about by increased heat, possibly due to friction along faults or by pockets of radioactivity in the crust. The depths of magma chambers vary from a few to twenty or more miles. Once they form, magma tends to rise or be forced to the surface through cracks or fissures. The magma chamber then becomes known as a feeding chamber.

Materials ejected from a volcano vary because as magma cools its components separate. The first materials to crystallize are relatively poor in silica oxides and rich in iron, calcium and magnesium. These sink to the bottom of the chamber, leaving lighter materials which are relatively richer in silica oxides on top.

A major effect of crystallization within the chamber is a concentration of gas within the remaining liquid. Ultimately, the gas pressure becomes too great for the reservoir roof to withstand and eruptions begin. Initial eruptions reduce the pressure, allowing more gas to separate from the liquid. Thus the eruptions become self-sustaining and gas is their driving force.

The principal gas is steam (H_2O) which can comprise as much as 95 percent of the discharge. Second is carbon dioxide (CO_2), and third is sulfuric acid (H_2SO_4) -- the gas that gives volcanoes their characteristic odor. Gases released in minor amounts include hydrogen, ammonium chloride, carbon monoxide, nitrogen, chlorine, and fluorine.

Eruptions may occur at any stage in the cooling and separating process and fissures may tap any level of the feeding chamber, resulting in a variety of lavas and volcanic products and formations. Lavas are primarily classified according to their silicon dioxide content, although the presence of other chemicals, texture, percentage and size of gas cavities, amount of crystallization, and size of crystals are also important.

Because silicon dioxide acts as an acid, lavas with silicon dioxide content exceeding 66 percent by weight are known as silicic lavas. Two of these are found in Lassen Volcanic National Park. Rhyolite has a silicon dioxide content of about 75%, while that of dacite is about 70 percent. These white to grayish or pinkish lavas are stiff and viscous even at high temperatures and thus permit gas to escape with difficulty often resulting in explosive types of eruptions.

A lava flow which appears rough and blocky is called Aa (ah-ah), while a smooth, ropey or cordlike looking flow is known as pahoehoe (pa-hoy-hoy). Whenever lava flows into water and cools rapidly, it forms balls or spheres up to several feet in diameter and is known as pillow lava. Sometimes fluid lavas form lava tubes as they cool. These interesting caves are formed when the outer surface of a flow cools and hardens while the interior is still fluid. The interior lavas then continue to drain out the end of the flow, leaving a hollow tube behind.

Sometimes a lava flow is so viscous (characteristic of acid lavas) that it cools before it has had a chance to crystallize. Then volcanic glass or obsidian is formed.

A bowl-shaped depression or crater is usually associated with the vent of a volcano as a result of the force of explosions. These rarely exceed three-quarters to one mile in diameter. Sometimes as a result of the draining of magma chambers, support is removed from the roof of a volcano and it may collapse on itself. Or perhaps a particularly violent eruption may blow the top away. In either instance, a caldera or depression much larger than the crater is formed. Calderas usually have steep sides and may have diameters of five to ten miles.

Some of the types of eruptions associated with volcanic activity are:

Icelandic: Lavas escape from fissures, rather than from central vents. More copious flows produce no volcanoes, but rather large, level plateaus such as the Columbian Plateau.

Hawaiian: Typified by fluid basaltic lavas in which gases are liberated quietly. Thus little or no fragmental material is produced, although fountains of lava may be projected by jets of escaping gas to heights of 1,000 feet or more. Abundant outpourings produce flat lava domes forming some of the largest mountains on earth, such as Mauna Loa.

Strombolian: Named after a volcano off the coast of Sicily, these eruptions tend to be of moderate intensity and occur at more or less regular intervals. Eruptions are accompanied by white vapor clouds and throw out glowing clots of magma (scoria) which cool to form bombs and lapilli. These eruptions occur with more viscous basalt and mafic andesite lavas.

Vulcanian: Although named after Vulcano, Italy, Vesuvius provides better examples of this type of eruption. Here, the crater crusts over solidly between infrequent eruptions. Then strong eruptions, sometimes sufficient to disrupt the cone, occur blowing out the obstruction. Pinos or huge cauliflower-like clouds of steam charged with fine particles are often formed. Lava may issue from the crater or fissures on the sides of the cone.

Pelean: The extreme in explosiveness, it is named after Mt. Pelee on the Island of Martinique, West Indies, where such an eruption in 1902 destroyed the city of St. Pierre and took 30,000 lives. Its distinguishing feature is the pyroclastic flow or glowing avalanche which contains superheated gas that is so full of glowing ash and other particles it obeys the force of gravity, rushing down the slopes of mountains with hurricane force. Several have occurred in the Lassen region.

Basalts have a silicon dioxide content of less than 52 percent and are termed mafic. They are dark colored and flow readily, allowing gas to escape with ease. Andesites are intermediate in characteristics between the acid and basic lavas. These lava types react with other factors to build volcanic formations including:

Basalt Plateaus: Magma under low pressure may erupt from groups of fissures, to spread as floods of basaltic lava. The Northwest's Columbian Plateau is North America's finest example.

Shield Cones: Copius swellings of more viscous basaltic lava construct volcanoes which in profile resemble low domes or inverted saucers. Examples within the park are Prospect Peak, Mount Harkness, and Red Mountain.

Composite Cones: These are formed of alternate layers of andesitic lava flows from effusive eruptions, and fragmental material from explosive eruptions. When exposed, a banding effect is evident. Examples include the high peaks of the Cascade Range: Mount Rainier, Mount Hood, Mount Shasta, and Lassen's ancient Mount Tehama.

Plug Domes: Extremely viscous masses of silicic lava emerge rapidly en mass from a vent to form a steep-sided, bulbous mound. These may vary from tens to thousands of feet in height. Lassen Peak is considered the world's largest plug dome volcano. Others in the park are Chaos Crags, Vulcan's Castle, and Eagle and Reading Peaks.

Cinder Cones: Magma under high pressure will erupt explosively to form steep-sided volcanoes. Usually they are symmetrical in shape, and are formed rapidly. Mexico's Paricutin, for example, grew 1,000 feet by the end of the second month. Generally, cinder cones are less than 1,000 feet high. Park examples include Red Cinder Cone, Hat Mountain, and Cinder Cone.

The fragmented materials that fall from the eruptive clouds of volcanoes are known as pyroclastic products or tephra and are named according to their size, texture, and composition. Material between pea and walnut size is called lapilli. Sand-sized material is called cinders. Smaller yet are ash and dust, although frequently no distinction is made between these two. Cinders, ash, and dust may become compacted and recemented to form volcanic tuff. Material larger than lapilli which was not molten when ejected is known as block. When it is recemented with other angular rocks, it forms a rock known as breccia.

If the material was still molten when ejected so that it formed a rounded or spindle-shaped object while solidifying in the air, it is known as a bomb. If its surface is cracked so that it reminds one of the crust of a loaf of French bread, it is known as a breadcrust bomb. Bombs compacted into rock with other large round ejecta form agglomerates.

Highly vesicular, frothy, light-colored ejecta, with density often low enough to float on water, is termed pumice. Pumice is generally siliceous and acidic in composition. Highly vesicular, frothy, dark-colored ejecta, which is less siliceous, more mafic, and more dense than pumice is termed scoria.

GENERAL VOLCANOLOGY

Technically, a volcano is a vent or chimney connected to a reservoir of molten material, a magma chamber, within the earth's crust. Ejected material usually accumulates around the opening, the vent, to build a cone, or "volcanic edifice." As popularly used, the term volcano includes both the vent and accumulated materials.

Origin of Volcanoes - Basic Considerations

Temperature of the earth's crust increases with depth. Rate of increase varies with locality and depth, varying from 86° to 122°F per mile. At great depths, the rate of increase diminishes. Forty miles below the surface, the temperature probably approaches 2200°F, the point where most materials liquefy. Earthquakes, however, demonstrate the solidity of such material, which remains solid or semi-solid due to tremendous pressure of overlying rock.

Magma usually collects at various levels within the crust to displace and/or incorporate surrounding rock and form a reservoir, the feeding chamber. These pockets of molten material near the surface may be formed by:

(1) Reduction of pressure, typically occurring in volcanic mountain belts.

(2) Increase of temperature, usually caused by reduction of pressure, radioactive breakdown of elements such as uranium, thorium, and/or earth movements along faults in the crust.

(3) Combination of these.

Once magma forms near the surface crust, it tends to rise, or to be forced to the surface by self-contained gases. A variety of formations may develop:

Basalt plateaus. Magma, under low pressure, may erupt forming swarms of fissures, to spread as floods of basaltic lava. The Northwest's Columbian Basalt Plateau is North America's finest example.

Shield Cones. Copius swellings of more viscous lava construct volcanoes which in profile resemble low domes or inverted saucers. Examples are Prospect Peak, Mount Harkness and Red Mountain.

Cinder Cones. Magma, under high pressure, will erupt explosively to form steep-sided volcanoes. Usually they are symmetrical in shape and are formed rapidly. Mexico's Paricutin, for example, grew 1,000 feet by the end of the second month. Generally, cinder cones are less than 1,000 feet high. Examples include Red Cinder Cone, Hat Mountain, and Cinder Cone.

Composite Cones. These are formed of alternate layers of lava flows from effusive eruptions and fragmental material from explosive eruptions. When exposed, a banding effect is evident. Examples include the high peaks of the Cascade Range: Mount Rainier, Mount Hood, Mount Shasta and ancient Mount Tehama.

Plug Domes. Extremely viscous masses of lava emerge rapidly and "en masse" from a vent to form a steep-sided, bulbous mound. These may vary from tens to thousands of feet in height. Lassen Peak is considered the world's largest plug dome volcano. Others are Chaos Crags, Mount Diller, and Reading Peak.

Materials ejected from a volcano vary in chemistry as components separate in the magma chamber. As magma cools, the first minerals to crystallize are poor in silica, but rich in iron, calcium and magnesium. As cooling progresses, minerals richer in silica and potassium develop. Heavier crystals, rich in iron, calcium and magnesium sink toward the chamber floor and leave the lighter, silica-rich residual liquid on top. Evidence suggests that eruptions may occur at any stage in the cooling and separation process, and fissures may tap any level of the feeding chamber.

A major effect of crystallization within the magma chamber is a concentration of gas within the remaining liquid. Ultimately, the gas pressure becomes too great for the reservoir roof to withstand and eruptions begin. Gas then becomes the driving force within a volcano.

Initial eruptions or explosions, whether gas, magma or a combination of the two, reduce the pressure and allow more gas to separate from liquid. In this manner, eruptions become self-sustaining.

The Product of Volcanoes

The principal gas, steam, is generally more than 95 percent of the total discharge, seldom less than 82 percent. Carbon dioxide is the second most common gas. Sulfurous gases such as sulfuric acid, H_2SO_4, create the characteristic odor of volcanoes. However, less is released than of water and carbon dioxide. Gases released in minor amounts include hydrogen, ammonium chloride, carbon monoxide, nitrogen, chlorine, and fluorine.

Naming of Volcanic Products

Fragmented or pyroclastic products are named according to size, texture, and composition of materials. Fine-sized materials, smaller than peas, include dust and ash which, when compacted to rock, form volcanic tuff. Fragmental material between pea and walnut size is termed lapilli. Material larger than walnut size is termed block, which when compacted to rock, forms volcanic breccia.

Volcanic Bombs are almond shaped, with twisted "ropes" of lava and cooling cracks. These form as large blobs of molten or semi-solid lava which solidify while falling through the air. Bombs compacted into rock with other large, round ejecta form agglomerates.

Highly vesicular, frothy, light-colored ejecta, with density often low enough to float on water, is termed pumice. Pumice is generally siliceous and acidic in composition. Highly vesicular, frothy, dark-colored ejecta, less siliceous, basic and more dense than pumice is termed scoria.

Types of Eruptions

Hawaiian: Exemplified by basaltic shield volcanoes such as Kilauea. Extremely hot, fluid lavas pour from summit vents and also from fissures on the mountain flanks. Fragmental material is minimal, as gases are liberated quietly.

Strombolian: Named after a volcano off the coast of Sicily. Rhythmic discharges occur at intervals of seconds or minutes, ejecting pasty, glowing clots of magma (scoria) which cool to form bombs and lapilli. Eruptions are accompanied by white vapor clouds. A few solid fragments are expelled. Lava swellings are on a very small scale, usually more viscous than the Hawaiian types. A cinder cone is the characteristic form.

Vulcanian: Named for Vulcano, Italy. Explosive discharges of viscous magma are spaced by intervals of quiescence. Solid, angular fragments are ejected, together with pasty lumps of magma-bombs and frothy pumice. The final phases are characterized by gas eruptions, which may continue hundreds of years after the last magma eruption. Huge cauliflower-like clouds of steam charged with fine ash are often formed. Flows are rare, and characteristic of siliceous magmas; those that do form cool to thick, stumpy tongues of obsidian.

Ultra-vulcanian: Only rock fragments are discharged, no lava. Normally these low temperature steam blasts occur as the first outbreak of a new volcano, or as initial explosions of older volcanoes after periods of dormancy.

Pelean: Named for Mt. Pelee on the island of Martinique, West Indies. Following production of highly viscous magmas, intense explosions of superheated steam blast great amounts of glowing ash and large fragment as glowing avalanches, or nuee ardente, over wide regions. Similar eruptions occurred at Lassen Peak in 1915.

Fissure: Lavas escape from fissures, rather than from central vents. More copious flows produce no volcanoes, but rather large, level plateaus such as the Columbia River Basalts.

The nature of volcanic eruptions is determined primarily by gas pressure and viscosity of the magma, both of which are controlled by magma composition and stage of cooling. Lava viscosity varies inversely with temperature and gas content.

The lower the viscosity, the greater the tendency to swell quietly and form low-lying structures. These lavas are of basic (basaltic) composition, relatively low in silicon dioxide, about 50 percent, but relatively high in iron and calcium oxide, about 20 percent.

High gas pressure is correlated with high viscosity, which increase the tendency toward explosive activity and formation of conical structures. Generally, these lavas are more acidic (rhyolitic dacitic) in composition, relatively rich in silicon dioxide, about 70 percent, but poor in iron and calcium dioxide, about 3 percent.

The layman's term, cinders, is used to include all fragmental material between ash and block in size.

Lava is the general term for all volcanic material extruded above ground, whether liquid or solid.

Lava character is determined by chemical composition, gas content, magma temperature and environment where extruded. Surface flows of lava are usually termed pahoehoe if appearing ropey or as cordlike corrugations, and Aa if appearing rough or blocky.

Lavas are classified according to composition and textural character, such as percentage and size of gas cavities, amount of crystallization, and selective size of crystals. Composition, the primary criterion for classification, determines most characteristics of flows. Lavas relatively poor in silica and rich in calcium, iron, and magnesium, the basalts, are more fluid than lavas with the reversed composition, the rhyolites and dacites. Occasionally these move greater distance and at greater speeds, to form thin layers, than the rhyolitic or dacitic lavas, which are pasty and sluggish. Basaltic lavas are generally 1800° to 2220°F. Siliceous lavas are generally 1100° to 1550°.Andesitic lavas are intermediate in chemistry between basalt and dacite.

Pillow lavas form whenever lava flows into water and cools rapidly.

Caldera versus Crater
(Hans Rick's Classification)

All calderas are related to volcanic topography. Many craters are not related to volcanic topography.

Volcanic craters are inseparably related to conduits. Calderas are not related to the roof of the reservoir.

Volcanic craters are the eruption vents. Calderas are never entirely eruption vents.

Volcanic craters are the vents through which ejecta passes. They are positive, active volcanic forms.

Calderas are the result of change in state or volume within the underlying reservoirs. They are negative, passive forms.

Volcanic craters occur during the active, growing periods of volcanoes.

Calderas are marks of decadence and age, although caldera formation may be followed by renewal of activity.

INDIAN USES OF PLANTS FOUND IN LASSEN VOLCANIC NATIONAL PARK

American Dogwood / Cornus sericea
Tribes: Northeastern California

(1) Food	Berries
(2) Medicine	Root and bark for cold and fever

Angelica / Angelica breweri
Tribe: Maidu

(1) Food	Greens
(2) Medicine	Rubbed on legs to prevent rattlesnake bite
(3) Music, Art and Religion	Dance ceremony

Balsam Root / Balsamorhiza sagittata
Tribes: Northeastern California

(1) Food	Roots, young leaves and stems, seeds raw or roasted
(2) Medicine	Roots as tea for rheumatism and headaches, root poultice on insect bites

Bedstraw / Galium spp.
Tribes: Northeastern California (1 and 2), Maidu (3)

(1) Food	Seeds
(2) Medicine	Fevers and inflammations
(3) Music, Art and Religion	Smoked in ceremonies

Black cottonwood / Populus balsamifera
Tribes: Northeastern California

(1) Food	Inner bark, catkins
(2) Medicine	Sap used on cuts
(3) Tools, Implements, Weapons	Gum used to waterproof baskets

Blue Camas / Camassia quamash
Tribes: Atsugewi, Maidu

(1) Food	Bulbs roasted, root eaten

Bracken Fern / Pteridium aquilinum var: pubescens
Tribes: Northeastern California

(1) Food	Young shoots, rhizomes
(2) Medicine	Rhizome to expel worms and heal wounds and burns
(3) Tools, Implements, Weapons	Roots for twine, rope, and baskets

Brodiaea / Brodiaea spp.
Tribes: Northeastern California

(1) Food	Bulbs raw or roasted

Buckwheat / Eriogonum spp.
Tribes: Northeastern California

(1) Food	Seeds raw or as flour, young stems raw or cooked
(2) Medicine	Leaves for headache or stomachache

Bush Chinquapin / Castanopsis sempervirens
Tribes: Northeastern California

(1) Food	Nuts, raw or roasted

California Red Fir / Abies magnifica
Tribes: Northeastern California

(1) Food	Inner bark; needles for tea (high in Vitamin C)

Cattail / Typha latifolia
Tribes: Northeastern California

(1) Food	Roots, stalks, young shoots, flower spikes, pollen
(2) Shelter & Furnishings	Pollen for pillows. Leaves for mats, roofing thatch, caulking canoes and houses
(3) Medicine	Root for poultice on burns and wounds

Clovers / Trifolium spp.
Tribes: Northeastern California

(1) Food	Leaves, seeds

Coyote Mint / Monardella odoratissima pallida
Tribes: Northeastern California

(1) Food	Leaves eaten raw or as tea
(2) Medicine	Tea for colds, indigestion, and fever

Elderberry / Sambucus spp.
Tribes: Northeastern California

(1) Food	Berries
(2) Tools, Implements, Weapons	Smoking pipes
(3) Music, Art and Religion	Flutes made from branches

Horsetail / Equisetum spp.
Tribes: Northeastern California

(1) Food	Inner pulp of stalks
(2) Medicine	Stalks for kidney and bladder trouble
(3) Tools, Implements, Weapons	Stalks used to polish arrows and other woodwork

Incense Cedar / Libocedrus colocedrus
Tribes: Northeastern California

(1) Food	Bark
(2) Shelter & Furnishings	Bark and slabs for building material
(3) Tools, Implements, Weapons	Fire making drills
(4) Medicine	Leaves for stomach trouble

Indian Paint Brush / Castilleja spp.
Tribes: Northeastern California

(1) Food	Flowers, seeds

Jeffrey Pine / Pinus jeffreyi
Tribes: Northeastern California

(1) Shelter & Furnishings	Roots for baskets

Knotweed / Polygonom bistortoides
Tribes: Northeastern California

(1) Food	Roots, young leaves
(2) Medicine	Roots very strong astringent, to stop bleeding, and diarrhea

Lady Fern / Athyrium filix-femina
Tribes: Northeastern California

(1) Food	Rhizome, shoots roasted or baked
(2) Medicine	Root boiled to expel tapeworm

Lovage or Wild Parsley / Ligusticum grayi
Tribe: Atsugewi

(1) Food	Leaves
(2) Medicine	Root for colds, coughs, stomachache
(3) Tools, Implements, Weapons	Poisoning fish

Manzanita / Arctostaphylos spp.
Tribes: Northeastern California

(1) Food	Berries eaten raw or used in flour and cider
(2) Medicine	Leaves for cuts, burns, and poison oak rash

Milkweed / Asclepias cordifolia
Tribes: Northeastern California

(1) Food	Stems and leaves, flower buds, seeds and seed pods; sap for chewing
(2) Medicine	Latex from stems for cuts, sores, and ringworm. Seeds boiled for snake bite poisoning; root for toothache
(3) Tools, Implements, Weapons	Stems for rope, nets, cloth, bowstring

Monkey Flower / Mimulus spp.
Tribes: Northeastern California

(1) Food	Leaves and stems, source of salt
(2) Medicine	Poultice for burns and wounds

Mountain Alder / Alnus incana
Tribes: Northeastern California

(1) Food	Inner bark
(2) Clothing	Bark used as a dye
(3) Medicine	Bark used for diarrhea, stomachache, and hemorrhages

Mountain Hemp / Apocynum androsaemifolium
Tribes: Northeastern California

(1) Food	Seeds
(2) Tools, Implements, Weapons	Cordage and netting

Mountain Mahogany / Cercocarpus ledifolius
Tribes: Maidu, Atsugewi

(1) Tools, Implements, Weapons	Sticks, splitting wedges, torches, digging sticks, fuel for sweats (low smoke)

Mountain Maple / Acer glabrum
Tribes: Northeastern California

(1) Food	Inner bark, shoots

Mountain Strawberry / Fragaria virginiana
Tribes: Northeastern California

(1) Food	Berries, young stems
(2) Medicine	Leaves for tea

Mule Ears / Wyethia mollis
Tribes: Northeastern California

(1) Food	Seeds, young shoots; leaves poisonous
(2) Medicine	Young shoots for nursing mothers
(3) Tools, Implements, Weapons	Fermented root used to poison arrow tips

Ocean Spray / Holodiscus microphyllus
Tribes: Northeastern California

(1) Food	Fruit

Ponderosa Pine / Pinus ponderosa
Tribes: Northeastern California

(1) Food	Nuts and inner bark, sap chewed, needles used in tea
(2) Medicine	Needles chewed for heartburn
(3) Tools, Implements, Weapons	Roots in basket making

Pondweed / Potamogeton spp.
Tribes: Northeastern California

(1) Food	Rootstocks

Popcorn Flowers / Plagiobothrys spp.
Tribes: Northeastern California
(1) Food — Leaves, shoots and seeds

Quaking Aspen / Populus tremuloides
Tribes: Northeastern California
(1) Food — Inner bark and sap
(2) Medicine — Bark for diarrhea, fever. Winter buds used in tea for coughs, sore throat. Tea used as wash for cuts and burns.

Sagebrush / Artemisia spp.
Tribes: Atsugewi/Maidu
(1) Medicine — Bark mixed with deer manure for toothache. Leaves and stems to prevent blood poisoning. Tea from leaves for diarrhea and colds. Hair wash.

Sedge / Carex spp.
Tribes: Northeastern California
(1) Food — Roots, stalks
(2) Tools, Implements, Weapons — Roots used in basketry and ropes

Service Berry / Amelanchier utahensis
Tribes: Northeastern California
(1) Food — Berries
(2) Shelter & Furnishings — Ladders from branches
(3) Medicine — Inner bark - snow blindness
(4) Tools, Implements, Weapons — Arrow tips, rod body armor, baskets, fish harpoons

Shooting Star / Dodecathoen spp.
Tribes: Northeastern California
(1) Food — Leaves and roots
(2) Medicine — Whole plant cooked and used as poultice for swelling

Sierra Currant / Ribes nevadense
Tribes: Northeastern California
(1) Food — Berries raw, cooked or dried

Sierra Gooseberry / Ribes roezlii
Tribes: Northeastern California
(1) Food — Berries raw or cooked

Snow Bush / Ceanothus cordulatas
Tribes: Northeastern California
(1) Food — Berries and seeds; leaves for tea

Squaw Currant / Ribes cereum
Tribes: Northeastern California
(1) Food — Berries eaten raw or cooked. Dried leaves raw or steamed; flowers
(2) Medicine — Berries to relieve stomachache
(3) Tools, Implements, Weapons — Wood used for arrow shafts

Staghorn Lichen / Letharia vulpina
Tribes: Northeastern California
(1) Food — Whole plant edible
(2) Music, Art and Religion — Yellow dye

St. John's-Wort / Hypericum formosum
Tribes: Northeastern California
(1) Food — Bulb raw or ground into flour

Sugar Pine / Pinus lambertiana
Tribes: Northeastern California
(1) Food — Gum for chewing, nuts, inner bark
(2) Medicine — Gum for healing burns, mild laxative, ulcers, and sores
(3) Tools, Implements, Weapons — Pitch used as glue for canoes and arrows

Sword Fern / Polystichum imbricans
Tribes: Northeastern California
(1) Food — Rhizomes baked or roasted
(2) Tools, Implements, Weapons — Fronds used to line earth ovens

Thistle / Cirsium spp.
Tribe: Atsugewi
(1) Food — Young stalks eaten raw or cooked
(2) Tools, Implements, Weapons — Stalks made into cord

Tobacco / Nicotiana spp.
Tribes: Northeastern California
(1) Medicine — Ceremonies to heal
(2) Music, Art and Religion — Religious ceremonies

Tobacco Brush / Ceanothus velutinus
Tribes: Northeastern California
(1) Food — Berries
(2) Medicine — Leaves smoked as tonic

Tule / Scirpus acutus
Tribes: Maidu (1, 2, 3, 4), Atsugewi (2, 3)

(1) Food	Roots, leaves
(2) Clothing	Leggings, blankets, skirts, headdresses
(3) Shelter & Furnishings	Mattresses, wall coverings, mats
(4) Tools, Implements, Weapons	Rafts, basket making

Tule Grass / Juncus spp.
Tribes: Maidu, Atsugewi

(1) Food	Leaves, shoots and roots
(2) Clothing	Woven into breech cloths, skirts, dance headdresses, shirts
(3) Shelter & Furnishings	Mats for doors, beds, summer shelters
(4) Tools, Implements, Weapons	Basket making

Western Buttercup / Ranunculus occidentalis
Tribes: Northeastern California

(1) Food	Raw plant poisonous; seeds and roots cooked

Western Juniper / Juniperus occidentalis
Tribes: Northeastern California

(1) Food	Berries eaten raw or made into flour
(2) Clothing	Green boughs burned to smoke hides to soften; snowshoe frames
(3) Medicine	Berries for colds; leaves and bark for tea
(4) Tools, Implements, Weapons	Basket making, fire making drills

White Fir / Abies conolor
Tribes: Northeastern California

(1) Food	Inner bark and gum
(2) Shelter & Furnishings	Boughs and bark used in building shelters
(3) Medicine	Sap used on cuts and wounds

Wild Barley / Hordeum brachyantherum
Tribes: Northeastern California

(1) Food	Seeds

Wild Caraway / Perideridia bolanderi
Tribes: Northeastern California (1, 3), Atsugewi (2)

(1) Food	Roots, seeds
(2) Tools, Implements, Weapons	Fish poisoning
(3) Music, Art and Religion	Used in ceremonies

Wild Mint / Mentha arvensis
Tribes: Northeastern California

(1) Food	Leaves eaten raw or in soups, stews and tea
(2) Medicine	Upset stomach, sore throat, headache and diarrhea

Wild Onion / Allium spp.
Tribes: Northeastern California

(1) Food	Bulbs raw or cooked, some species leaves and stems
(2) Medicine	Bulbs for stomach gas, poultice on tumors, ulcers, and earaches. Juice for sore throats, coughs, and insect bites

Willow / Salix spp.
Tribes: Northeastern California (1, 3, 4), Maidu (1, 2, 3, 4)

(1) Food	Inner bark
(2) Clothing	Shredded inner bark for diapers, inner bark for skirts
(3) Shelter & Furnishings	Branches for sweat lodges and shelters
(4) Tools, Implements, Weapons	Baskets, tanning hides, tying, traps, and nets

Bibliography

Balls, Edward K. 1962. Early Uses of California Plants. University of California Press, Berkeley, CA.

Bungay, Rod. 1987. The Edible Wild Plants of Butte County. R.B. Publishing, Magalia, CA.

Garth, Thomas P. "Kinship Terminology; Marriage Practices, and Behavior Toward Kin Among The Atsugewi." July 1944, American Anthropologist. Vol. 47, No. 4.

Goforth, Dwain. 1984. A Checklist of The Vascular Plants of Lassen Volcanic National Park. NPS, Mineral, CA.

Heizer, Robert F. and Elsasser, Albert B. 1980. The Natural World of the California Indians. University of California Press, Berkeley, CA.

Hill, Dorothy J. 1970. Maidu Use of Native Flora and Fauna. Dorothy J. Hill, Chico, CA.

Lassen Loomis Museum Association. 1983. Indian Ways Nature Trail. Lassen Loomis Museum Association, Mineral, CA.

Mead, George R. 1977. The Ethnobotany of the California Indians. A Compendium of the Plants, Their Users and Their Uses. Ethnology Series No. 30. Museum of Anthropology. University of Northern Colorado, Greeley, CO.

Nelson, Raymond L. 1962. Trees and Shrubs of Lassen Volcanic National Park. Lassen Loomis Museum Association, Mineral, CA.

Schulz, Paul E. 1954. Indians of Lassen Volcanic National Park and Vicinity. Lassen Loomis Museum Association, Mineral, CA.

Compiled by Marilyn Cannon, Educational Consultant, February 1995

PLANTS AND ANIMALS OF LASSEN VOLCANIC NATIONAL PARK

Although Lassen is primarily known for its volcanic geology, the park boasts a rich diversity in plant and animal life. Over 700 flowering plant species grace the park, providing shelter and food for 250 vertebrates (animals with backbones) as well as a host of invertebrates including insects.

This great diversity of life forms is due to two factors--the geographic location of the park and the abundance of habitats that occur there.

Situated at the southern end of the Cascade Range geologic province, Lassen Park lies at the crossroads of three great biological provinces--the Cascades to the north, the Sierra Nevada mountains to the south and the Great Basin desert to the east.

The myriad of habitats in Lassen Park are allowed by variations in such environmental conditions as elevation (5,000 to 10,457 feet), moisture (precipitation is greater on the western than the eastern side of the park), substrate (rock type and soil depth), temperature, insolation (amount of sun) and prior disturbance (both natural and man-caused).

Habitats and their resident plants and animals can be arranged into communities named after their predominant plant species or by some other descriptive term such as climate or general vegetation type. The following survey is a brief introduction to the major communities of Lassen Park. It is important to remember that animals are mobile and thus may occur in more than one community, and also that some species are ubiquitous--that is they occur over a wide range and refuse to be categorized at all.

MIXED CONIFER FOREST (YELLOW PINE FOREST). At the lower elevations in the western part of the park (below about 6,500 feet) is a rich forest community characterized by a mix of conifers. The most common trees in this forest are Jeffrey pine, ponderosa pine, incense cedar, sugar pine, and white fir.

Common wildflowers and food plants for wildlife include gooseberries, currants, squawcarpet ceanothus, snowberry, stickseeds, Indian warrior, miner's lettuce, campion, spotted coralroot, pinedrops, pipsissiwa, snow plant, and pyrola. This rich forest is home to a host of animals including the common flicker, olive-sided flycatcher, western wood pewee, white and red-breasted nuthatch, brown creeper, Townsend's solitaire, great horned and pygmy owl, yellow-bellied sapsucker, pileated woodpecker, skunk, and a variety of rodents.

UPPER MONTANE FOREST (RED FIR FOREST). Just above the mixed conifer forest lies a forest zone containing less diversity than that found at lower elevations. Here, at elevations in the park between 6,500 and 8,000 feet, occur dense red fir forests with little understory and fewer animals.

In the more open areas western white pine is common and on thin soils occur lodgepole pine. At this elevation, winter snows lie deep and summer temperatures are cool in the dense shade of the red fir.

The upper montane forest does have its characteristic animals, although most are rather shy and secretive. Living in this forest are the Williamson sapsucker, hermit thrush, black-backed woodpecker, snowshoe hare, red fox, and pine marten.

Many animals make no distinction between the mixed conifer forest and upper montane forest, and so live happily in both. This is especially true for a number of forest dwelling birds, such as the Steller's Jay, western tanager, golden-crowned kinglet, owls (spotted, flammulated, saw-whet, and great grey), woodpeckers (hairy, downy, and white headed), solitary and warbling vireos, evening grosbeak, and dark-eyed junco. Forest mammals include the porcupine, chickaree (or Douglas' tree squirrel), northern flying squirrel, and chipmunks.

SUBALPINE. As one rises above the forest zone in Lassen Park the trees begin to take on a more gnarled character and bare patches of ground intersperse between the wooded areas. The subalpine community is a land of extremes, with shaded hollows collecting very deep drifts of snow (up to 40 feet!) while adjacent areas may remain snow free due to the fierce winter winds. The subalpine areas do contain, however, a distinctive assemblage of plants and animals that can tolerate, and often thrive, in the harsh conditions.

The subalpine community in Lassen Park (between 8,000 and 10,000 foot elevations) is the home of two distinctive and beautiful conifers, the whitebark pine and the mountain hemlock. The pine prefers the drier sites while the hemlock does well in moist shaded areas. Both trees are subject to the harsh winter weather and are often forced into a prostrate position known as krummholtz ("crooked wood").

Because of the abundance of sun and variation in moisture at this high elevation, the subalpine is host to a large number of shrubs and beautiful wildflowers, including red heather (or Brewer's mountain heath), white heather (or Merten's cassiope), rock spirea, sandwort, Sierra pincushion, spreading and prickly phlox, silky raillardella, rock cress, wallflower, Lobb's nama, coyote mint, Lyall's lupine, rock fringe, ballhead ipomopsis, eriogonums, Davis' knotweed, Indian paintbrush, and penstemons.

Because of the rich and varied flora in the subalpine community, there is also a host of birds and other animals common to the area. Most notable are Clark's nutcracker, mountain chickadee, mountain bluebird, Cassin's finch, yellow bellied marmot, and pika (or cony).

ALPINE. The alpine community is the region above the treeline that experiences intense sunlight, desiccation winds and very cold temperatures. The wind keeps many areas snow-free all year--adding to the moisture stress--while other areas may have snow patches lasting into late August or throughout the year. The alpine is often considered a desert because during most of the year water is tied up in the frozen solid state--and hence unavailable for plant life.

And yet, the alpine community manages a yearly blossoming of life during the brief summer. Many plants are adapted to the harsh conditions (mostly by forming small mats or cushions that conserve heat and moisture), and each year a small number of animals hurry to gather food for the long winter that is just around the corner.
Common plants in the alpine include pussy toes, pussy paws, golden draba, timberline phacelia, skunk-leafed polemonium, eriogonums, alpine sorrel, alpine (or Tolmei's) saxifrage, dwarf hulsea, and Davidson's penstemon.

Animals in the alpine include the gray-crowned rosy finch, Clark's nutcracker, pika, and some small rodents.

MEADOWS. The meadows, grasslands and herbaceous areas of Lassen Park can be divided into two major types: the dry meadows and the wet meadows. Wet meadows have an abundance of soil moisture throughout the growing season and are characterized by sedges and rushes. Dry meadows tend to dry up before the summer is over and are characterized by grasses and herbs.

Meadows of both types occur in a wide range of elevations and localities in Lassen Park. As such, meadow plants and animals seen in one part of the park may not necessarily occur in another.

Meadows support a rich diversity in plant life and provide food for a large number of animals. They are, in fact, the best place to watch wildlife.

Common wildflowers of Lassen's meadows include lilies, meadow rue, spirea, bog kalmia, Bigelow's sneezeweed, buttercups, senecio, gentians, blue-eyed grass, clovers, corn lily, spring beauty, alpine shooting star, marsh marigold, sticky cinquefoil, checker (or sidalcea), giant red paintbrush, monkey flowers, elephant heads, meadow penstemon, cow parsnip, angelica, and violets. Animals of Lassen's meadows include killdeer, sparrows, shrews, mole, voles, pocket gopher, badger, western toad, Belding ground squirrel, and meadow mice.

MOUNTAIN CHAPARRAL. In certain areas of Lassen Park thick brush fields of mountain chaparral cover the landscape. Chaparral can occur anywhere there are steep rocky slopes or where disturbance such as fire has upset the natural balance of the more typical forest.

Mountain chaparral is characterized by the presence of such shrubs as greenleaf manzanita, huckleberry oak, chinquapin, and two species of ceanothus (tobacco brush and snow brush). Wildflowers include Washington lily and dogbane. A large number of birds and animals live in the chaparral due to abundant food and good cover from predators. Most notable are mountain quail, fox sparrow, cottontail, deer mouse, and dusky-footed wood rat.

JEFFREY PINE/JUNIPER WOODLAND. In the eastern part of Lassen Park are large areas covered with drier, open forests characterized by the sweet smelling Jeffrey pine. This community is a transition between the mountain environment and the Great Basin desert to the east. The most notable plant species include Jeffrey pine, western juniper, rabbitbrush, sagebrush, mule ears, mountain mahogany and sulfur flower. Animals of the Jeffrey pine/juniper woodland are a mixture of many from the mixed conifer forest plus additions from the Great Basin desert such as flycatchers, black-tailed jackrabbit, and chipmunk.

RIPARIAN AREAS. Areas along stream banks have many of the same plants and animals as meadows but have larger deciduous shrubs and animals that require running water. Included in this community are Lassen Park's only native fish, rainbow trout, as well as a host of aquatic insects.

Common plants are willows, mountain alder, black cottonwood, quaking aspen, creek dogwood, columbine, fireweed, brooklime, monkshood, larkspur, and leopard lily.

Animals along the stream side include dipper (or water ouzel), hummingbirds, belted kingfisher, warblers, aplodontia (or mountain beaver), mink, salamanders, and newts. A special habitat for birds is that of lake shores where the pied-billed grebe, Canada goose, mallard, American coot, and spotted sandpiper are found.

UBIQUITOUS SPECIES. As mentioned earlier, some animals range over a number of plant communities. Mammals on the move include mule deer, black bear, coyote, red fox, golden-mantled ground squirrel, long-tailed weasel, mountain lion, bobcat, and bats.

Dwain L. Goforth, 3/84

HISTORY NOTES
LASSEN VOLCANIC NATIONAL PARK AND SURROUNDING AREA

1821: Don Louis Arguello led an exploring expedition into Northern California and passed near the Lassen region. His padres named the mountain San Jose (later renamed Lassen Peak).

1827: Mt. Shasta named Sastise after a tribe of Indians by Peter S. Ogden who may have been the first white man to pass through the Lassen region.

Jedediah Smith named Lassen "Mt. Joseph." Actually, he applied the name to the whole range of mountains from 39 to 41 degrees latitude.

1841: Wilkes map added Saint to the name and restricted it to the peak proper.

John Bidwell, Peter Lassen, Burnheim, and Indian guide discovered and named Mill Creek.

1843: October 11 - Peter Lassen filed for a land grant from the Mexican government.

1844: July 25 - Peter Lassen became a Mexican citizen.

December 26 - Lassen's land grant, Rancho Bosquejo, approved, aided by John Sutter and John Bidwell. It lay south of what is now Vina and included the mouth of Deer Creek and totaled 22,000 acres, or 5 leagues. Lassen attempted to establish Benton City on his rancho; the city was named after Senator Thomas Hart Benton, Fremont's father-in-law. He also applied the name Sister Buttes to Lassen Peak and Brokeoff Mountain.

1845: Lassen invited William B. Ide to come to his ranch and build a sawmill. Shortly later, after a misunderstanding, Ide moved north to the present site of Tehama.

1846: Captain John Charles Fremont and some of his men visited Lassen's ranch in the spring of the year.

Applegate brothers established the southern Oregon Trail.

1847: (Summer) Lassen, along with Commodore Robert F. Stockton, backtracked the newly established Oregon Trail from Goose Lake to Missouri in hopes of encouraging emigrants to settle at Benton City.

Major Pierson B. Reading was a signer of the Treaty of Cahuenga. He also served as paymaster for Fremont's battalion and was involved in the Bear Flag Revolt. In 1848, he discovered gold on Clear Creek.

June 30 - Lassen granted the land he owned north of Deer Creek to Daniel Sill who was his ranch manager.

1848: (May) The Masons of the State of Missouri issued a charter for Western Star Lodge #98 at Benton City, California (currently located at Shasta). Peter Lassen was Junior Warden.

(Fall) Lassen returned to California leading a wagon train along a route using much of the old Applegate Trail. He deeded a large share of his land to General John Wilson and Joel Palmer. Lassen had now deeded away two-thirds of his land.

January 24 - John Marshall discovered gold at Sutter's Sawmill at Coloma.

July 4 - John Bidwell discovered gold in Feather River, later brought the Arroyo Chico Rancho.

1849: Black Rock mines discovered.

J. Goldsborough Bruff arrived in California by way of the Lassen Trail. While still in the mountains, he became sick and remained there while the others in his party continued to the Sacramento Valley. They never returned for him and he nearly starved during the hard winter.

Battle Creek named after a bloody battle between Indians and trappers.

October 30 - The Masonic Lodge finally established at Benton City; the delay was probably due to the gold rush.

1850: Bruff used the name Snow Butte for Lassen Peak, a name which had been used throughout the 1840's.

(July) Peter Lassen led a party in a search for Gold Lake. By mid-August, miners reportedly took out $100 to $1,500 a day at Myers diggings.

January 4 - Legislature passed a bill creating Reading County.

February 18 - The above bill amended and the name changed to Shasta County. At this time, Shasta County was bounded on the north by Oregon, on the east by Nevada, on the southeast by Butte County, and on the west by Trinity County.

1851: (Spring) William Nobles, seeking gold, was with a party of men who came to Honey Lake. The party disbanded but Nobles continued eastward looking for the rumored Gold Lake; then he intersected the Oregon Trail at Black Rock Point, Nevada. Realizing that this newer, easier route to California could mean wealth to him, he returned via what is now known as the Emigrant Trail to Anderson and from there went north to Shasta.

Masonic Lodge moved to Shasta. This probably indicates that Benton City was declining by this time and that due to gold prospecting in the Trinity mountains, Shasta was on the increase.

Grover K. Godfrey made the first recorded ascent of Lassen Peak. Capt. J.W. Maxwell also reported to have climbed the peak.

Two prospectors arrived at Georgetown, El Dorado County, and reported passing an active volcano which apparently was Cinder Cone.

Peter Lassen and Burton built the first log cabin at Indian Valley, 4.5 miles east of present Greenville. Here they raised vegetables which they sold to gold miners. The site of the cabin is now marked by California Historical marker #184.

1852: A license was granted to D.D. Harrill and Co. to operate a ferry across the Sacramento River at the mouth of Cow Creek. It is now known as Emigrant Ferry (there is a memorial on the highway 2 miles north of Anderson). Harrill was also one of the men from Shasta who went with Nobles to verify his route.

May 3 - William Nobles obtained a $2,000 subscription from the citizens of Shasta in return for his promise to reveal his new route. He then returned to Humboldt River (Nevada) to divert emigrants to Shasta.

1853: Nobles moved to Minnesota to continue a campaign to interest people in his route.

Maj. Reading led a party that surveyed the Nobles Pass as a possible railroad route.

John H. Drebelbis traveled Nobles route and wrote about it for Hutchings California magazine, June 1857.

1854: Plumas County created by legislators.

(June or July) Isaac Roop opened a trading post at Roopstown, later called Susanville.

The Minnesota legislature sent Nobles to Congress to make a speech about his route. Congress passed a bill for $300,000 to improve the route.

1855: Lassen moved to Honey Lake where he and Isaac Roop worked together to promote that community (now Susanville).

1856: Tehama County formed from the southern portion of Colusa County.

April 26 - A gathering of approximately 20 settlers met and drew up a paper setting up laws and regulations for a new territory to be called Nataqua. Isaac Roop and Peter Lassen were chosen recorder and surveyor respectively.

August 19 - The Wood and Long train arrived at Honey Lake under the leadership of General Allen Wood.

1857: April 28 - Legislature passed an act to provide for a wagon road from Oroville to Honey Lake. The assumption was that when a transcontinental railroad was built, it would go to Fort Reading and they hoped to turn it in their direction. The measure was defeated in

Black Butte and Plumas Counties. Perhaps the Central Pacific would have used Nobles Trail eastward if the act had passed.

August 4 - Honey Lake's independence challenged by action of Plumas County Board of Supervisors.

August 8 - A large convention held by settlers west of the Sierras. They desired that a new territory be created between California and Utah. Isaac Roop was elected one of the convention's four vice presidents; later elected territorial governor.

1858: January 5 - J. Williams, Peter Lassen and Isaac Roop acted as sub-agents of the superintendent of Indian Affairs for California. J.T. Henly signed a treaty with Winnemucca, Chief of the Paiutes.

1859: Local Indians rounded up by militia and taken to Round Valley Indian Reservation (By 1963 most of them had left the reservation because of poor conditions. In 1868 many of them were rounded up and returned to the reservation once again.)

April 26 - Peter Lassen was killed by an unknown party near what is now Clapper Creek. He was with two other men at the time, Clapper and Wyatt. Clapper was also killed.

1860: Charles F. Hoffman served as Topographer for the Whitney Survey until 1874.

Edward R. Drake settled in Warner Valley.

Peter C. Crumbaugh came to Red Bluff and grazed sheep in the vicinity of Crumbaugh Lake.

During the 1860s, James M. King lived in Kings Creek Meadows area running horses and mules. He also operated a race track in Sacramento Valley at Pine Grove.

1861: February 11 - F.W. Lander, appointed superintendent of an expedition to map Fort Kerney south pass and Honey Lake Wagon Road as a possible national military route, submitted his report.

1862: Idaho mining excitement broke out, leading to the legislative act of April 14, 1863 granting a franchise to John Bidwell et. al who established the Chico and Humboldt Wagon Road Company from Chico to Susanville.

1863: The C. Brewster-Clarence King party climbed Lassen Peak. In their writing they referred to statements having been made that steam was observed coming from the Chaos Crags between 1854 to 1857.

1864: Lassen County was created.

Major Reading and K.V. Bumpass filed a claim at "Bumpass Hell." Reading also led the third

recorded party to ascend Lassen Peak. This party included Helen Tanner Brodt, the first woman to climb Lassen Peak, and her husband Aurelius.

1865: The first reference to the geology of the Lassen region is contained in Whitney's Survey Memoir. The party included W.H. Brewster, C.F. Hoffman, and Clarence King. This party first recognized what is now known as Mt. Tehama's crater.

K.V. Bumpass burned at Bumpass Hell.

T.M. Boardman made arrangements for developing the sulphur and clay potential of the "Sulphur Works" area under the supervision of Dr. Supan, a well known chemist. They bought the area from Simmons in 1866.

April 3 - Pierce and Francis, backed by General Bidwell, started a weekly saddle train from Chico to Idaho at a cost of $66 per trip. There were 40 passengers in the first train.

July 11 - First stage from Chico to Ruby City passed through Susanville. Black Rock Mines rediscovered about this time.

1866: July 1 (midnight) The first stage of the California and Idaho stage and Fast Freight Company left Chico, arriving in Ruby City 5 days and 3 hours later, a distance of 423 miles. The capital stock of this company was $200,000; John Millen was the company's president.

August 22 - Yana Indians raided the Dersch place on Bear Creek and killed Mrs. Anna Maria Dersch, wife of George who had settled the place in 1861.

1867: John T. Edwards registered at Shingletown. In 1871 he moved to Santa Barbara. In 1885 he returned to Manton where he operated teams for the Klotz mill and pulled teeth for early settlers.

1871: What was believed to be the last Yahi Indians were killed at Kingley Cave.

1874: H.W. Harkness, a president of the California Academy of Sciences, described a visit to Cinder Cone in which he verified the activity reported in the winter of 1850-51.

Benjamin F. Loomis came to Viola at the age of 18. He became a hotelman, lumberman, amateur naturalist and photographer. He and his wife Estella played an important role in the establishment of Lassen Volcanic National Park.

The Tom Malgin family bought a 400 acre sheep ranch in the Drakesbad area. By 1881, they had developed open log conduits and a log bath house which became well known throughout the state.

1875: Jim Payne settled on Antelope Creek.

1878: Lt. S.E. Tillman climbed Lassen Peak; he surveyed a large area including Oroville, Quincy, and the Lassen region for the Corps of Engineers.

1883: Professor J.S. Diller first visited the Lassen region and started a series of studies of the area that extended for 40 years.

(April) William H. Coffey homesteaded 40 acres which he sold to Francis Harris on August 2, 1902. (The Herbert Kraft Company Bank in Red Bluff sold this property to W.B. Armstrong on April 5, 1904, and he in turn sold to B.F. Loomis on January 6, 1926 for $1,000. Loomis later donated the land to the U.S. Government.) Coffey and John E. Stockton had formed a partnership in the early 1880s and posted a claim to water rights from Little Manzanita (Reflection) Lake in 1883.

1884: Fred Dersch established a sheep ranch on Hat Creek near Raker Peak and built a cabin and corral in Dersch Meadows. He was killed by Indians at his ranch on Bear Creek which lay outside what is now the park boundary.

1887: (October and December) William Bartels filed claims to water rights from Manzanita Lake.

1890: Brokeoff Meadows patented by Jeff and John Ogburn. It was known for many years as Hollensworth Flat.

1893: It is guessed that Mrs. Selena LaMarr, Indian of the Atsugewi tribe, was born in this year.

Jessen Meadows was sold by Wilson to Andres Jessen and Nelson Stewart who used it for a summer cow camp. It later became a part of the Devastated Area.

1897: Clark and Hillebrand published 48 analyses of volcanic rocks from the Lassen area.

Anklin Meadows, which was homesteaded by Richard Anklin, was sold to W.W. Elmore. It was destroyed by the Great Mudflow of May 19, 1915.

1900: Chief Shavehead, the last chief of the Hat Creek Indians, died.

Drakesbad was named by Alex Sifford when he bought the property from Edward R. Drake.

1902: (April and June) Joseph A. Rossi filed claims to water rights from Lost Creek.

1904:(June) Albert W. Smith homesteaded 160 acres near Manzanita Lake. On November 15, 1906 he sold this and adjacent 120 acres to H.H. Noble, who in turn sold these properties to the Northern California Power Company. PG&E, who took over the power company, sold this land to the Federal Government on February 26, 1931 for $15,000, half of its assessed valuation.

1905: June 2 - Lassen National Forest established.

1907: May 6 - President T.R. Roosevelt signed proclamation establishing Cinder Cone and

Lassen Peak National Monuments.

October 30 - Badger Flat, also previously known as Pine Meadows and Booker Flat (after John R. Booker of Redding), was patented by Horace Herbert. It was sold to Hugh Addington in 1946 and purchased by the Federal Government in 1948.

1911: August 29 - Ishi, the last of the Yahi Indians, captured at slaughterhouse near Oroville.

September 4 - Ishi was taken by Professor Waterman to the University of California where he lived for 5 years.

1912: The Northern California Power Company built a small earth dam which raised the water level of Manzanita Lake a few feet.

1913: (Spring) A Forest Service lookout was built on top of Lassen Peak.

1914: May 30 - First eruption from Lassen Peak, witnessed by Bert McKenzie of Chester.

May 31 - Forest Ranger Harvey Abbey became the first person to climb the peak after the eruption.

June 9 - G.R. Milford took the first published pictures of the eruption.

June 14 - Lance Graham struck by a rock from the volcano and left for dead on the mountain. He was later rescued.

June 23 - Professor J.S. Diller returned to Lassen Peak to study new eruptions and climb to the top of the peak. He returned on July 15.

October 12 - The fire lookout completely demolished by eruption.

1915: May 19 - True lava issued from Lassen Peak, resulting in a mudflow.

May 22 - The Great Hot Blast and a second mudflow occurred.Professor R.S. Holway, U.C. Berkeley, was the first man to reach the crater after the eruption of May 19 and 22.

June 2 - The name Lassen Peak officially adopted.

1916: August 9 - The John Raker bill establishing Lassen Volcanic as the 13th national park was signed by President Wilson.

1925: A.L. Day and E.T. Allen published <u>The Volcanic Activity and Hot Springs of Lassen Peak</u>, summarizing most of the numerous geological studies done in the park from 1915 to 1925.

A road was built from Manzanita Lake up Manzanita Creek to Crescent Cliffs.

1926: (February) L. Walker Collins became first park superintendent and served until July 20, 1935. Prior to this date Lassen Volcanic National Park was administered by Yosemite National Park.

The Warner Valley Ranger Station was the first building constructed by the Park Service. Snow damaged it during the following winter and it was rebuilt in 1927.

A volcano observatory was established by the USGS at Mineral on the SW slope of Lassen Peak under the direction of R.H. Finch.

1927: Dr. Howel Williams started his geological research in the park.

April 30 - Exclusive jurisdiction of the park ceded by California legislature to the Federal Government. Summit Lake Ranger Station built in this year.

July 4 - B.F. Loomis dedicated the Mae Loomis Memorial Museum which he built in memory of his daughter who died January 13, 1920 from influenza.

1928: R.H. Finch and C.A. Anderson restudied the Cinder Cone and vicinity.

March 27 - Congressional act provided for the naming of a peak for John E. Raker.

April 26 - The land near Mineral on which the headquarters area is located was added to the park.

May 21 - A Congressional act allowed the Federal Government to exchange lands with the state.

1929: January 19 - A Congressional act provided for enlarging the boundaries of the park. The southern link of the Park Road to the base of Lassen Peak completed.

B.F. Loomis donated Loomis Museum and 40 acres of land to the Federal Government.

(September) Old trail from Sulphur Works to base of Lassen Peak via Lake Helen completed.

1930: April 19 - A Congressional act adjusted the boundary of the park in Section 30 T30N R5E.

August 11 - Work started on Lassen Peak trail.

August 13 - PG&E granted the Federal Government a 100 foot wide right of way in Section 18 T31N R4E.

1931: Lassen Park Road completed; Raker Memorial built.

January 26 - A Congressional act prohibited any new acquisition of property or rights of way, etc., in the park.

July 1 - Entrance fees were collected for the first time.

July 18 - Sierra Club register installed on Lassen Peak.

1932: Lake Helen snow cabin completed.

1933: Bronze plaque commemorating Helen Tanner Brodt placed at Lake Helen Picnic Area.

1935: Mt. Tehama named by Dr. J. Volney Lewis. It was previously called Brokeoff Cone and Brokeoff Volcano by Dr. Howel Williams, U.C., 1932.

115,000 silver salmon planted in Juniper Lake.

Bumpass Hell Trail completed.

(July) Ten cabins were built by the Lassen Park Company.

(August) The lecture platform at the Manzanita Lake campfire circle was completed and the lodge dining room opened to the public.

1938: (November) Seismograph station at Mineral completed.

1948: August 24 - Mt. Conard named in honor of Arthur L. Conard, organizer and president of Lassen Park Development Association, who worked hard for the establishment of the park. (The mountain was previously known as Black Butte.)

1951: Mrs. Selena LaMarr started participating in the Indian Lore Program presented during the summer months in the park.

1952: (November) Sulphur Works area added to the park.

1961: August 10 - Section 19 T31N R4E and other parcels of land in Sections 4 and 11 added to the park.

1962: October 11 - A strong storm caused a large number of the park's large trees to be blown down.

1966: The Lassen Chalet, Sulphur Works Campground, and the Southwest Entrance Station completed.

1972: April 11 - PL 92-272 transferred 482 acres to Lassen National Forest in T31N R5E W 1/2 Section 1 and NW 1/4 Section 12.

October 19 - PL 92-510 established 78,982 acres of the park as wilderness.

December 12 - Red Mountain T30N R5E, Section 34 renamed Sifford Mountain for Alex Sifford.

1973: (Summer) Lake Helen Snow Survey cabin torn down.

1974: April 26 - Manzanita Lake area declared a hazard zone and all facilities (concessioner, campground and employee housing) closed. Temporary employee and visitor use facilities relocated in Section 13.

1975: April 11 - Loomis Museum entered in the National Register of Historic Places.

November 10 - A 24 mile portion of the Nobles' Emigrant Trail within the park has been placed on the National Register of Historic Places.

1976: (May) Loops C, D, E, and F of the Manzanita Lake Campground were reopened for visitor use.

December 16 - National Park Service in cooperation with USGS increased the monitoring capabilities of the volcanic features. Installation of five seismometers, two tiltmeters and two inclinometers.

1977: (August) Public meetings on final draft of the General Management Plan were held first week in August. These meetings were held to provide for wide citizen participation through which the National Park Service would receive ideas and suggestions from the public to use in formation of the park's General Management Plan.

1978: Entered on National Register of Historic Places: March 30 - Prospect Peak Fire Lookout, May 5 - Horseshoe Lake Ranger Station, and October 3 - Administration Building at Park Headquarters

1981: (January) The General Management Plan was approved.

1982: (Summer) The chairlift was installed at the Lassen Park Ski Area.

1989: Amendment to the General Management Plan designating certain areas of Manzanita Lake to be reopened for day use.

1993: Last year Lassen Park Ski Area operated. Ski lifts removed in August.

September 17 - Loomis Museum opened to the public as the primary contact facility.

PIONEER TOYS

Make a willow whistle

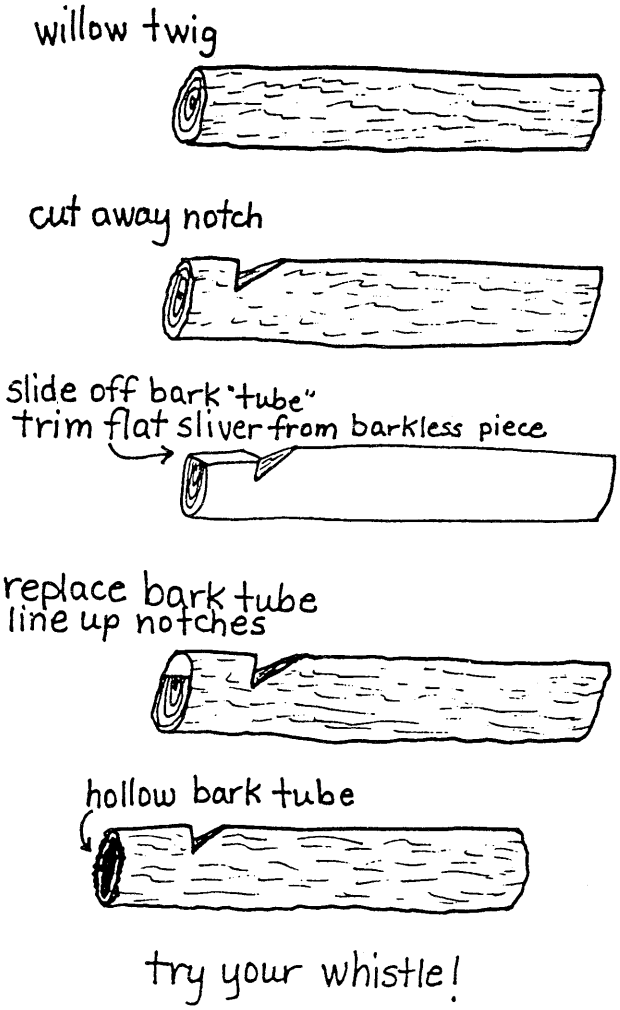
Pioneer children liked to play with toys as much as today's children, but their toys had to be made by hand. One of the toys they enjoyed was the willow whistle.

Directions for making a willow whistle follow. The help of a parent or older brother or sister who can safely use a penknife may be needed. It can be tricky, so don't give up if it doesn't work the first time.

Materials:
Willow branch, one-half inch in diameter
Penknife

Directions:

1. Cut a three inch length of willow, cutting between buds or leaves.
2. Loosen the bark from the twig by rolling it on a hard surface, or by bending it in different directions. Be careful not to split the bark.
3. Cut a notch in the twig, about one inch from the end. The notch depth should be one-third the thickness of the twig.
4. Slide the bark "tube" off the twig, without tearing the bark.
5. Take the "barkless" part and hold it with the notch facing upwards. At the notched, end, trim a small flat sliver off the top. (The flat surface should be no deeper than half the depth of the notch.)
6. Replace the bark tube, line up the notches, and try your whistle! Blow into the notch end of the whistle. If it doesn't work, try making the notch deeper, or trim a bit more from the flat surface.



Note: Look for willows near lakes and streams. They have long, narrow leaves that turn yellow in September.

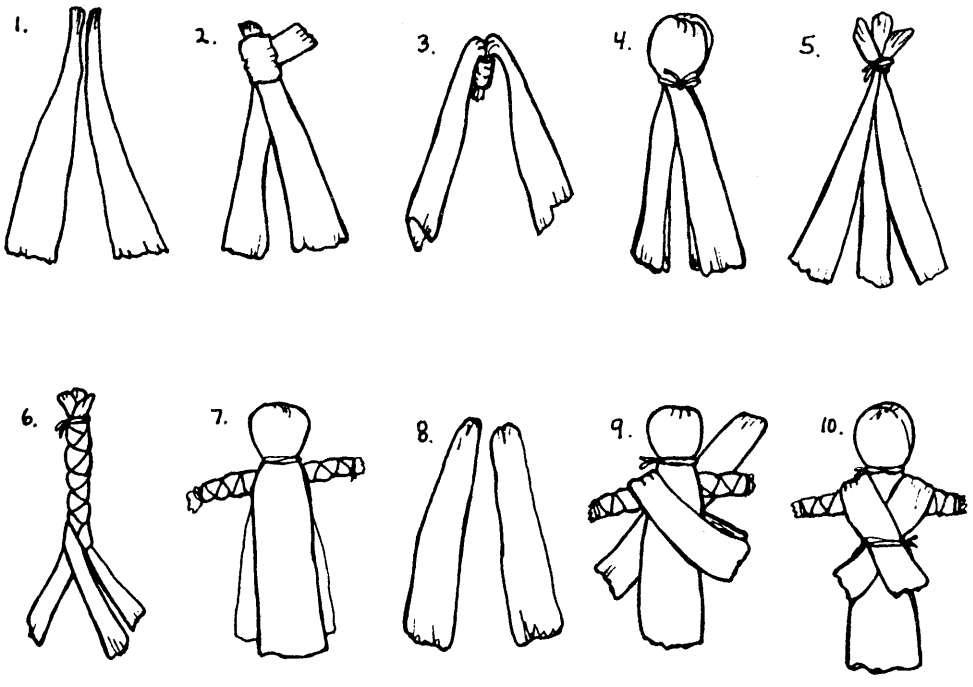
Reprinted from Chico Enterprise-Record by permission of Author Penny Brown.

Make a corn husk doll

Corn husk dolls were a favorite toy of pioneer children. Try making one of these old-fashioned toys, using the instructions below. If you can't get fresh corn husks, dried husks can be purchased at a grocery store. Read through all the directions before getting started.

Materials:
Five corn husks, soaked in warm water for a few minutes
Scissors
Colored yarn

Directions:
1. Pinch together the ends of two husks.
2. Wrap another husk around the ends, making a big lump.
3. Fold the first two husks down over the lumpy one.
4. Tie yarn around the lump and outer husks to shape the head.
5. Split another husk into three strips, then tie together at one end with yarn.
6. Braid together, then tie off another end.
7. Slide the braid between the first husks, to make the arms.
8. Split the last husk into two strips.
9. Fold one strip over each shoulder for the shirt.
10. Tie a yarn belt around the doll's waist. With paint or markers, add a nose, eyes, and mouth if you wish.



Reprinted from Chico Enterprise-Record by permission of Author Penny Brown.