



## HABITATS

### South Dakota Forests

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# THE BLACK HILLS FOREST

## What Is The Black Hills Forest?

When people think of the Black Hills, they usually think of the bountiful and beautiful conifer forest that gives the Hills their Lakota name, *Paha Sapa*, "hills that are black."

The Black Hills are an uplift located on the Missouri Plateau of the Great Plains. The dome-like uplift has a central core of granite rock, surrounded by deeply eroded *sedimentary* deposits. The Hills extend about 124 miles north to south and 62 miles east to west. The highest peak is Harney Peak in the central core, at 7,242 feet above sea level. The base of the Hills is at about 3,200 feet above sea level.

The Black Hills began their development over 600 million years ago, during the Paleozoic era. For several hundred million years, the area was a vast shallow sea, in which layer after layer of *marine sedimentary* deposits accumulated. At the beginning of the Cenozoic era, about 50 to 60 million years ago, the westward drift of the continent created the forces that pushed western South Dakota up into a dome-like structure. After this uplift, which took millions of years, streams began to erode the layers of sediments and expose the rock beneath. This pro-

cess formed the Black Hills we see today, with the exposed granite outcroppings surrounded by forest-covered *sedimentary* deposits.

The Black Hills were not affected by glaciation, since the farthest western extent of the glaciers in South Dakota was the present-day Missouri River. The slow action of wind and water erosion continue to shape the Hills today.

## What Is The Climate Of The Black Hills Forest?

The western South Dakota prairie is characterized by low precipitation; 13 to 18 inches per year (33 cm - 45.7 cm) with 70% to 80% of the precipitation occurring during the summer. Temperatures are affected by a continental climatic pattern, resulting in hot summers and cold winters. The Black Hills have a more moderate climate than the surrounding prairie. Clouds, approaching from the west, must reach higher altitudes to pass over the Hills. The cool temperatures of the higher altitudes cause the clouds to lose their moisture as they pass over the Hills. Because of this rain shadow effect, annual precipitation in the Hills is generally over 20 inches, while the prairie to the east is quite dry. Also, the moisture in the Hills is more evenly distributed

throughout the year, with 60-70% occurring in the summer. Temperatures in the Hills are about 5° F warmer than the average western plains temperatures in the winter, and 6° F cooler, on average, in the summer.

The Black Hills Forest has several *microclimates*, due to the varying *topography*. For example, the northern Hills have a more stable and slightly cooler climate than the southern Hills. The temperature in the southern Hills fluctuates more and the area is drier. The climate of the central Hills is intermediate.

### How Does Elevation Affect The Forest?

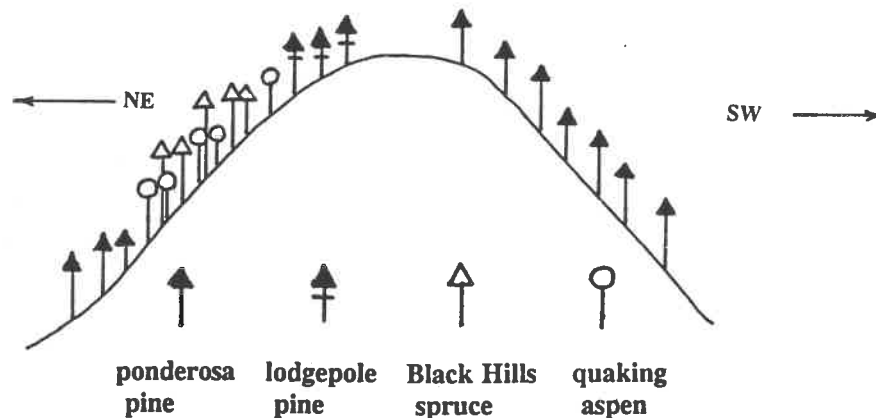
As the elevation increases, the climate becomes cooler and more moist. This is characteristic of mountain climate patterns. The Black Hills, being a small mountain mass, do not have a well developed *climatic gradient*, but some trends can be noted. At the edge of the Hills, mixed grass prairie grows. Along the streams descending from the Hills onto the prairie, grow willow, green ash, hackberry and elm. Bur oak can be found along these ravines, particularly in the northern Hills. As you begin to move up the slopes into the Hills, ponderosa pine dominates the forest. On the cooler north-facing slopes, ponderosa pine gives way to quaking aspen and birch. Further up the north-facing slopes, as conditions

continue to become more cool and moist, the aspen and birch decrease as more Black Hills spruce appear. The south-facing slopes are warmer and drier, hence, ponderosa pine may dominate the forest. An example of this gradient is illustrated below in Figure 1.

### What Makes The Black Hills Forest Unique?

The Black Hills is a special place. It has a unique combination of climate and *topography* that results in a rich diversity of plant and animal habitats. It is where "east meets west," and has characteristics of eastern and western forests. Western species, including the ponderosa pine and limber pine, realize their eastern-most extension in the Black Hills and isolated pockets on the Pine Ridge and Rosebud Indian Reservations. Eastern species, like bur oak and American elm, reach the western extent of their natural range in the Black Hills.

Paper birch, quaking aspen and white spruce are not typically found in the central part of the United States. These trees are part of a remnant forest left in the Black Hills approximately 8,000 years ago. As the climate began to warm at the end of the last Ice Age, most of the cool climate tree species spread north into Canada. Since the climate remained cool in the upper elevations of the Hills, these species continue to survive there.



**Figure 1: Diagram of a ridge showing the distribution of trees along the northeast and southwest slopes.** Notice that the drier south-facing slope is dominated by one species. (Hoffman and Alexander, 1987)

## **Why Is The Black Hills Forest Important?**

Ancient people used the resources of the Black Hills forest as many as 11,000 years ago (Cassells, 1986). The *Paha Sapa* has always been a sacred place to the Lakota people. According to Lakota legends, "From the great needles of rock that touch the sky, the medicine men call the Mighty Spirit" (Legends of the Mighty Sioux, 1941). The Lakota and Dakota people traveled to the Hills for the curative powers of the warm springs, to hunt wild animals, and to cut poles for their teepees. Sites such as Bear Butte, *Mato Paha*, where councils of chiefs once were held, still serve today as ceremonial locations.

Forest products industries have been using and managing the forest resources of the Black Hills for over 100 years. The need to harvest trees for timber began shortly after the gold rush near the city of Custer in the 1870's. Today, trees are harvested for lumber, and sawmill by-products are used for wood pellets, paper, particleboard, and decorative bark.

The Black Hills forest is more than a stand of trees. The biological community of the Hills is diverse and very different from the communities found elsewhere in South Dakota. The extensive, diverse forest of the Black Hills can support a larger, more diverse animal community than can be sustained in the more isolated pockets of forest in the prairie.

Birds that are found in the Black Hills forest, but do not occur in the prairies or more eastern forests, include canyon wren, gray jay, Clark's nutcracker, and Cassin's finch. The American dipper that dives underwater to catch its prey, and the ruffed grouse who provides an elaborate drumming display during mating season, are particularly interesting forest species to observe. Some eastern species, such as blue jay, eastern bluebird, pine siskin, and goldfinch also can be found in the Black Hills.

The Black Hills forest is home to mammals such as marmots, porcupine, and even flying squirrels. The Black Hills is the only place in South Dakota where you can see the pine marten and fringe-tailed myotis bat, both endangered species. Large predators such as bobcat, black bear, and mountain lion need the remote areas of the Black Hills forest in order to survive today.

Tourism, hunting and fishing are important industries for the cities in the Black Hills. The bases for these industries are the fish, birds and mammals that rely on the Black Hills forest for survival.

## **Has The Black Hills Forest Changed Recently?**

Early photographs show abundant streamside communities of willow, elms and ash, but with the introduction of domesticated grazing animals, these forests have been reduced in size or eliminated. Control of fires and timber harvesting activities have also changed the composition of the forest in the Black Hills. Early travelers in the Black Hills, over 100 years ago, reported the forest was composed of mostly small, open-grown trees. A botanical report of 1874, prepared by N. H. Winchell says of the ponderosa pine:

"This is the only species of pine found in the Black Hills. The trees generally are small, but sometimes nearly two feet in diameter. They sometimes stand thick, but usually are very spare. They constitute the forest entirely, except near the divide in the northwestern part of the Hills, where they are mixed with spruces."

The Black Hills Forest have changed from a hundred years ago. Today, there are cities, towns and ranches in what was once forest. A century of fire suppression has allowed the forest to grow thicker. Intermingled public and private land complicates management and use of the land.

## Glossary

**Climatic Gradient** - the successive changes in climate and associated communities that are found as one increases in elevation up a mountain.

**Marine** - referring to oceans or salt water seas.

**Microclimate** - the climate in the immediate vicinity of a location.

**Sedimentary** - rocks that are formed from material that settles to the bottom of a body of water. Sedimentary rocks are formed of many layers of fine material deposited over a long time.

**Topography** - surface features of the land.

## References

Cassells, Steve, 1986. Prehistoric Hunters of the Black Hills. Johnson Publishing Company, CO.

Ferrell, E.K., P.E. Collins and W.G. Macksam, 1957. Trees of South Dakota. Cooperative Extension Service Circular 566, SDSU.

Hoffman, G.R. and R.R. Alexander, 1987. Forest Vegetation of the Black Hills Nation Forest of South Dakota and Wyoming: A Habitat Type Classification. USDA Forest Service Research Paper RM-276.

Work Projects Administration, 1941. Legends of the Mighty Sioux, compiled by the S.D. Writers Project. Badlands Natural History Assoc., Interior, SD.

## Resources for Teachers

*Black Hills, Geological Gem of the West*, a video by Mr. Teachout from the Black Hills Petrified Forest, grades 9-12.

*South Dakota Forests*, a video by the South Dakota Society of American Foresters, Spearfish, SD, grades 4-12.

### Written by:

Dr. John Ball, SDSU, Brookings, SD 57007.

Dave Erickson, SD Division of Forestry, Pierre, SD 57501.

Lisa M. Gerwulf, student in Wildlife and Fisheries Science Dept., SDSU, Brookings, SD.

### Reviewed by:

Craig Brown, SD Division of Forestry, Watertown, SD 57201

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