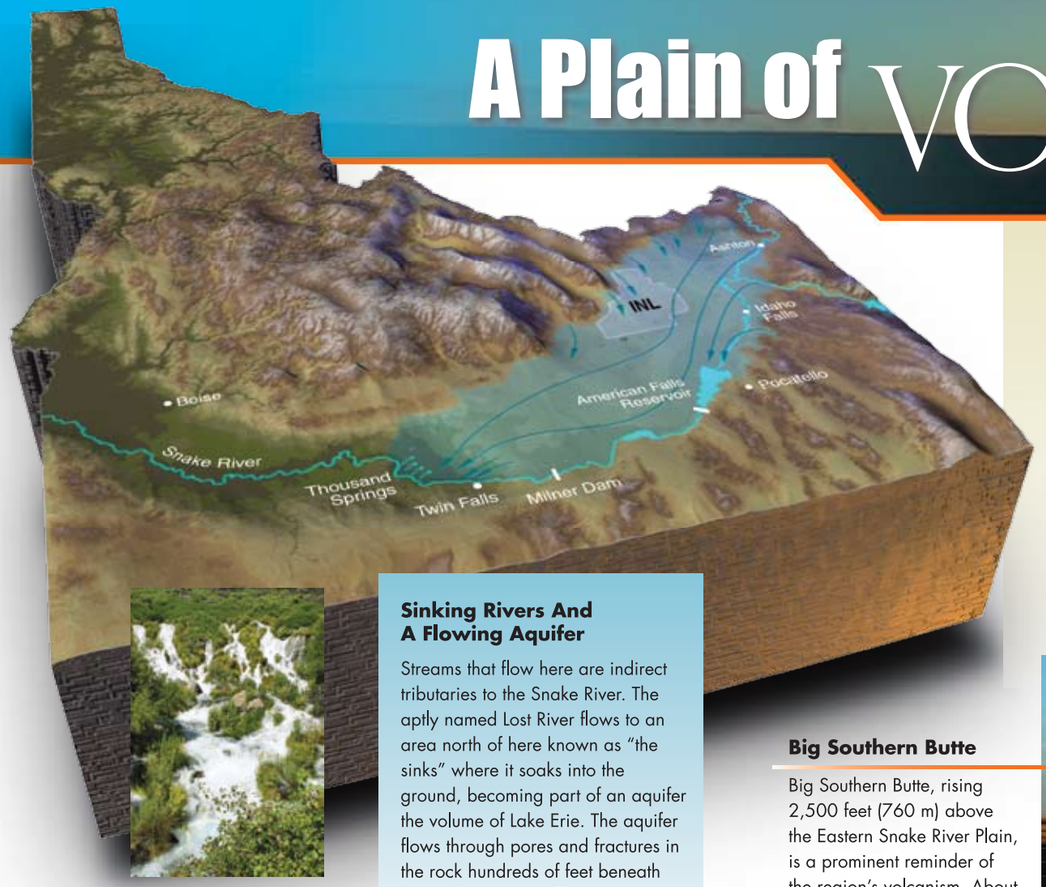
A Plain of VOLCANOES



Niagara Springs is located at Thousand Springs State Park near Hagerman, Idaho.

Sinking Rivers And A Flowing Aquifer

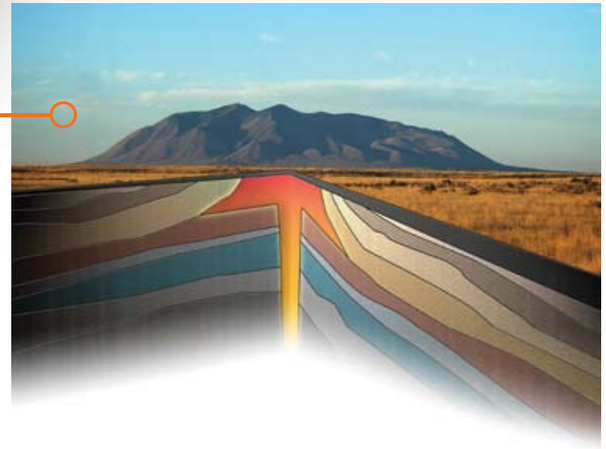
Streams that flow here are indirect tributaries to the Snake River. The aptly named Lost River flows to an area north of here known as "the sinks" where it soaks into the ground, becoming part of an aquifer the volume of Lake Erie. The aquifer flows through pores and fractures in the rock hundreds of feet beneath the surface, eventually emerging from springs along the Snake River Canyon at Thousand Springs about 100 miles (160 km) to the southwest.

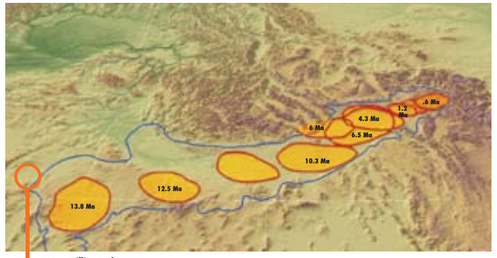
The shallow arc of Idaho's Snake River Plain spans southern Idaho, gently rising from west to east. Current theories suggest that the plain marks the path of continental movement over a deep hotspot now lying beneath the Yellowstone Plateau. As the continent drifted southwestward over millions of years, calderas—super-volcanoes 10 - 40 miles (15 - 64 km) wide—erupted over the hotspot.

In the past 17 million years, there have been about a dozen catastrophic eruptions releasing huge volumes of rhyolitic magma and ash. Between these super-eruptions were long periods when more fluid basaltic lava flowed from more than 8,000 shield volcanoes and numerous lava cones. Remnants of these dot the Eastern Snake River Plain today. Layer upon layer of basalt flows extend 3,000 - 6,000 feet (1,000 - 2,000 m) below the surface, completely covering the rhyolite "basement."

Big Southern Butte

Big Southern Butte, rising 2,500 feet (760 m) above the Eastern Snake River Plain, is a prominent reminder of the region's volcanism. About 300,000 years ago, the butte intruded through surrounding layers of basalt, rising to an elevation of 7,560 feet (2,300 m). It is one of the largest composite rhyolite domes in the world.



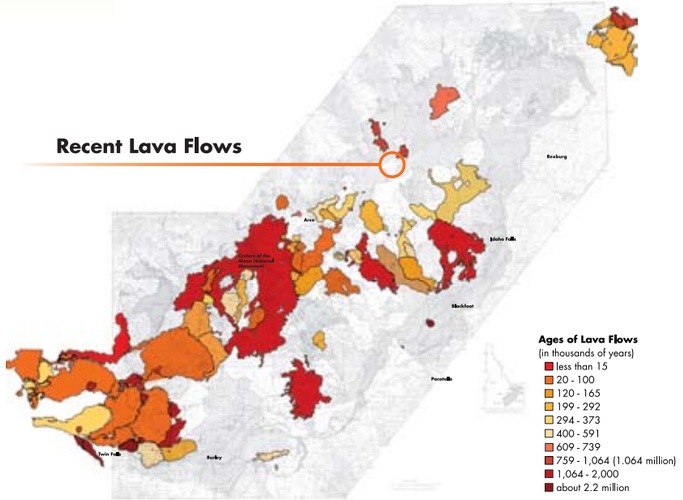


Ma = millions of years

Ancient calderas are evidence of the North American Continent's movement over the Yellowstone hotspot.

When Yellowstone Caldera erupted 640,000 years ago, it released about 240 cubic miles (1,000 km³) of material, covering half of North America in 6 feet (2 m) of debris.

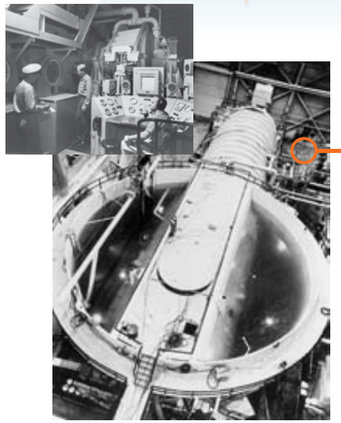
Recent Lava Flows



Idaho's National LABORATORY

Naval Proving Ground

This area was first used by the U.S. government in the 1940s to test artillery.



Dawn of the Nuclear Navy

The technology for the world's first nuclear-powered submarine was pioneered in Idaho. From 1953 to 1994, thousands of sailors in Admiral Rickover's Nuclear Navy trained here using full-scale submarine prototype reactors.

Beginning the Atomic Age

In 1949, the newly formed Atomic Energy Commission established the National Reactor Testing Station. In the 1970s, the site was designated a national laboratory.

The First Peaceful Use of Nuclear Power

In 1951, one of the most significant 20th century events took place nearby—the first usable amounts of electricity generated by nuclear power. The Experimental Breeder Reactor Number I (EBR-I) is a Registered National Historic Landmark, open to the public from Memorial Day weekend through Labor Day. *(To visit EBR-I, go east 1.5 miles and follow the signs.)*

During the Cold War, the national laboratory processed spent nuclear fuel at the "Chem Plant" to recover valuable isotopes used for national defense missions.

Spent nuclear fuel and specific types of waste stored at the Idaho National Laboratory Site are destined for disposal in facilities outside of Idaho.

Over the decades, more than 50 nuclear reactors have been built and operated here—the largest concentration of reactors in the world.

Experimental Breeder Reactor No. I
(1951 - 1963)

Materials Test Reactor
(1952 - 1970)

Boiling Water Reactor Experiment No. 1
(1953 - 1954)

Boiling Water Reactor Experiment No. 3
(1955 - 1956)

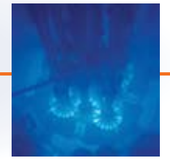
X-39 Aircraft Nuclear Propulsion reactors
(1955 - 1960)

Experimental Breeder Reactor No. II
(1961 - 1994)

Zero Power Physics Reactor
(1969 - 1992)

Power Burst Facility
(1972 - 1985)

Loss-of-Fluid Test Facility
(1973 - 1985)



Advanced Test Reactor
(1967 - Present)

Welcome to the SAGEBRUSH STEPPE

Did you know?

Pronghorn are perhaps the fastest animals in the world. Cheetah and pronghorn have both been clocked at more than 60 mph, but beyond sprinting, pronghorn can sustain speeds above 30 mph for miles.

What is the Sagebrush Steppe?

The sagebrush steppe—a Russian word meaning treeless plain—is a temperate, semi-arid landscape of shrubs and widely-spaced bunchgrasses.

A Dramatic Climate

Scarcity of water—coupled with cold winters; hot, dry summers; and dramatic daily and seasonal temperature swings—places severe constraints on plants and animals.

Average precipitation	**8 inches/year**
Typical summer highs	**90 to 95 F (32 to 35 C)**
Typical winter lows	**10 to 30 F (-10 to -1 C)**
Elevation	**Around 4,900 feet (1,500 m)**

Great Basin Desert

High Desert

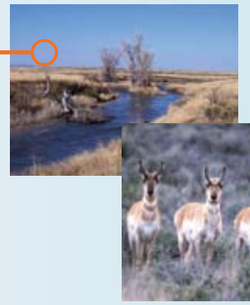
With an average elevation of 4,900 feet (1,500 m), this area is at a northern tip of the largest desert in the United States, the Great Basin Desert.

Cold Desert

Winter on the steppe is cold and windy with soils remaining frozen, and snow on the ground for three months or more. Most precipitation comes in the form of snow, which can accumulate in drifts that last into late spring.

The Quest for Water

In water-limited ecosystems, surface waters like the Big Lost River can increase plant and animal diversity. Riparian areas provide additional moisture for wetland plants, cottonwood trees for nesting raptors, and habitat for waterfowl, shorebirds and even trout. The Big Lost River probably flowed here year-round before upstream diversions reduced flows to the lower river. It now remains dry most of the year.



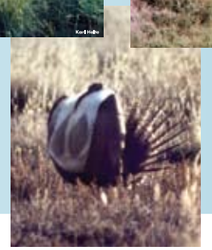
Cottonwood trees on the Big Lost River

Pronghorn

Burrowing owl

Elk

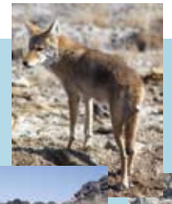
Bluebunch wheatgrass



Sage grouse

Mule deer

Spiny hopsage



Coyote

Pygmy rabbit

Sagebrush

Sagebrush lizard

More Diverse than Meets the Eye

Dominated by aromatic big sagebrush, this ecosystem is home to more than 400 species of plants that provide habitat for 250 wildlife species including mule deer, pronghorn, sage grouse, burrowing owls, pygmy rabbits and even elk.

Some animals of the sagebrush steppe require sagebrush to survive. For some, sagebrush is a food source, especially in winter when many plants are covered by snow. For others, sagebrush provides protective cover.

Examples of "sagebrush obligate" species are pygmy rabbits, sage grouse, sage thrashers, sage sparrows, sagebrush voles and sagebrush lizards.

Prehistory and RECENT HISTORY

A Source of Obsidian

Big Southern Butte was frequently visited by Native American groups. It was a source for obsidian, a volcanic glass used for arrow and spear tips. Archaeologists have found the Butte's unique obsidian at sites throughout Idaho, Montana, Utah and as far away as California's Joshua Tree National Monument. Today, the Butte and surrounding landscape remain spiritually important to the descendants of these groups, the Shoshone-Bannock Tribes.

The pictograph panel (above) shows figure drawings that are unique to this area.

Photo of 1900s Shoshone, courtesy of the Shoshone-Bannock Tribes

Earliest People

People have lived on these lands for more than 10,000 years. Native American hunting and gathering parties valued the plain's resources as shown by archaeological evidence—stone tools, ancient campsites and pictographs.

Native Americans, specifically Shoshone-Bannock Tribes, continue to value the natural and cultural resources of these lands. The Idaho National Laboratory Site lies within the aboriginal lands of the Shoshone and Bannock people. Tribal members work with the U.S. Department of Energy to protect the significant resources found here.

Big Southern Butte — A Waypoint for Thousands of Years

"Just passing through, ma'am"

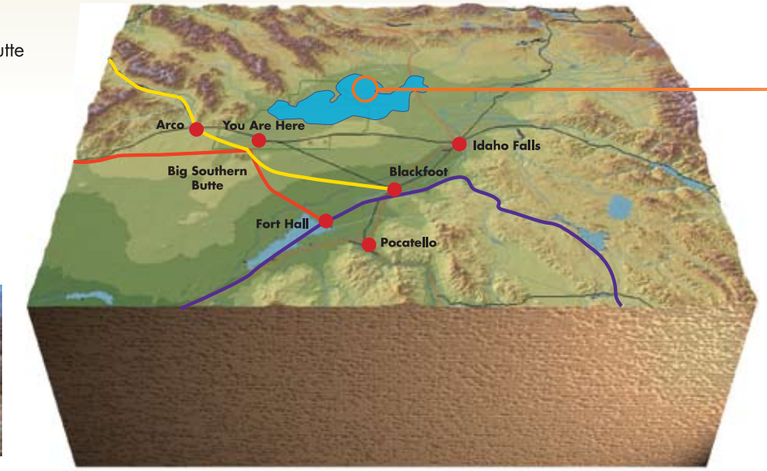
The harsh conditions on the plain discouraged most long-term settlement, but Big Southern Butte was a clear waypoint. In the 1800s, travelers headed toward Fort Boise would often take the Goodale Cutoff, an Oregon Trail shortcut. They would leave Fort Hall on the Snake River (about 40 mi [64 km] southeast), and head toward the Butte's sharp silhouette, passing to its north. An 1878 stage line from Blackfoot to the copper mines near Mackay and Challis followed a similar path. Later, the Oregon Short Line Railroad followed the same route.

Travelers on the Oregon Trail, and later stagecoach lines and the Oregon Short Line Railroad, relied on fresh water from springs at the base of Big Southern Butte.

"...travelers on the Challis Stage Road find the Big Butte Station a pleasant place to stop..."
Idaho News (Blackfoot, Idaho), June 25, 1887

Historic artifacts reflect the broken dreams of those who attempted to settle here.

The Oregon Short Line freight train at the Arco depot in 1912, 11 years after the line was completed.



Oregon Trail
Goodale's Cutoff
Oregon Short Line

Ancient Lake Terreton

Throughout most of the Pleistocene epoch—about 1.8 million to 10,000 years before present—a large shallow inland lake and surrounding streams and wetlands provided abundant resources for the plain's nomadic people. Mammoths, camels and other Ice Age fauna were abundant.

The lake and Ice Age mammals disappeared when the climate changed about 10,000 years ago. Mud Lake is the modern remnant of the ancient lake.

The Energy of INNOVATION

Nuclear reactor design, infrastructure testing, unmanned aerial vehicle development and biotechnology applications are among INL's diverse capabilities.

Advanced Facilities for Advanced Research

Scientists and engineers work at research facilities in Idaho Falls and various locations across INL's 890-square-mile (2,300 km2) site. Using state-of-the-art laboratories, they conduct a wide range of engineering and scientific research supporting multiple programs and missions:

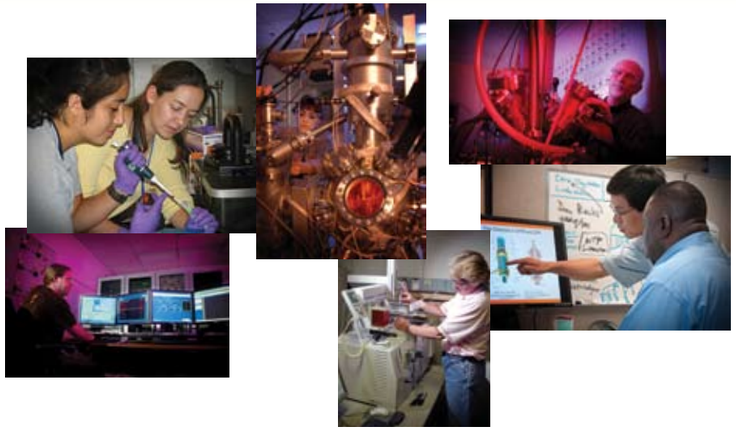
- Advanced nuclear fuels, materials and separations
- Bioenergy, fossil energy, geothermal energy, hydrogen and renewable energy systems
- Robotics, instrumentation control and intelligent systems
- Microbiological, geological and environmental systems

Idaho National Laboratory (INL) is the nation's lead laboratory for nuclear energy research and development and is one of 10 multiprogram national laboratories supporting the U.S. Department of Energy's missions.

In addition, the laboratory develops technologies and equipment for private industry and the Department of Homeland Security, helping to:

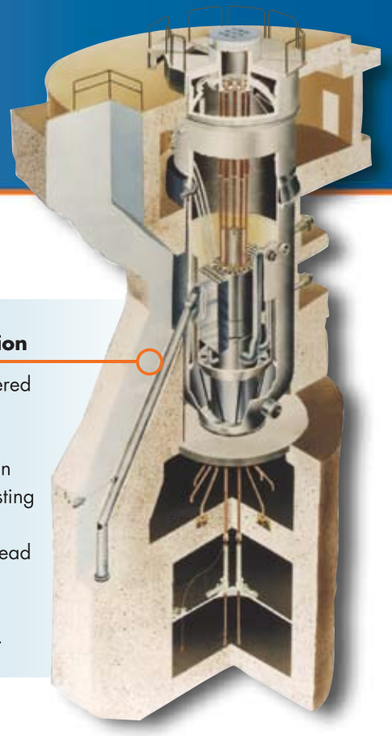
- Protect important infrastructures like electric grids, telecommunication networks and transportation systems
- Reduce risks to worldwide nuclear energy systems
- Secure our borders and cities from terrorist threats

INL also supports other government agency work, including the manufacture of tank armor for the Department of Defense, and the production of nuclear power sources used by NASA for space exploration.



A Long and Proud History of Contribution

Idaho National Laboratory researchers pioneered many of the world's first nuclear reactor prototypes and advanced safety systems. The lab's internationally recognized contributions in nuclear science, engineering and materials testing underpin the safe operation of nuclear power plants throughout the world. INL continues to lead in developing the next generation of nuclear energy technologies and educating the next generation of nuclear scientists and engineers.

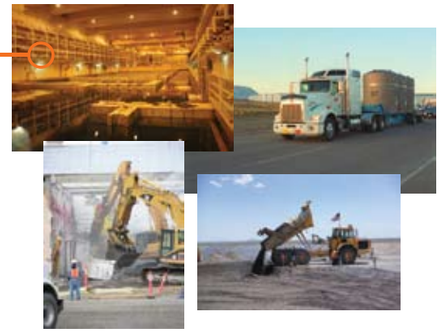


Cleaning up the Legacy of Past Missions

Ongoing safe environmental cleanup is focused on reducing risks and protecting the Snake River Plain Aquifer.

Cleanup work includes:

- Disposing of nuclear materials
- Stabilizing and storing spent nuclear fuel
- Treating and disposing of radioactive waste
- Cleaning up contaminated soil and water
- Demolishing unused and outdated facilities



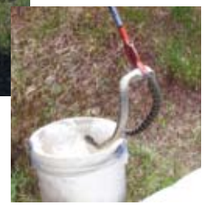
A National Environmental RESEARCH PARK

One of seven DOE Environmental Research Parks

In 1975, 890 square miles of Idaho (about twice the size of Grand Teton National Park) was designated a National Environmental Research Park. This designation provides scientists a protected outdoor laboratory to answer questions about natural environmental systems and long-term human impacts.

Intact Sagebrush Communities: A Vanishing Resource

While sagebrush ecosystems have steeply declined, decades of restricted access to Idaho National Laboratory have provided a refuge for this vanishing resource.



A Great Place for Research

The Research Park is ideally suited for long-term ecological studies. Scientists also develop applied ecological engineering solutions to minimize environmental impacts of energy research and development.

A Fire-prone Ecosystem

Fire is a natural process in the sagebrush steppe and any given area can be expected to burn perhaps once a century.

1994 Butte City Fire

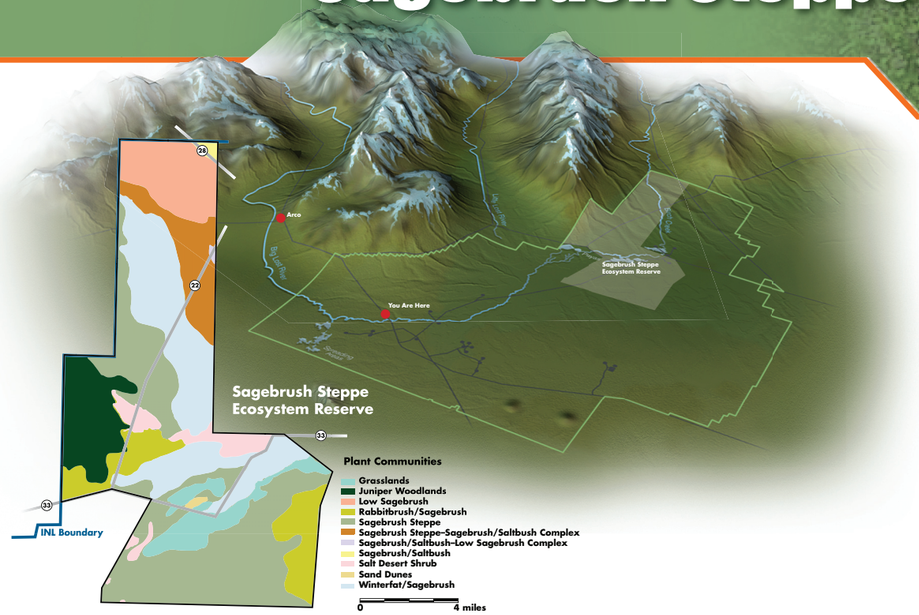
Landscape After the Fire

Recovery Three Years Later

Healthy Systems Recovery

After a fire, the landscape may seem barren, but many plant species of the sagebrush steppe quickly re-sprout. Researchers have learned that healthy plant communities return in good health.

Sagebrush Steppe ECOSYSTEM RESERVE



The Sagebrush Steppe Ecosystem Reserve and its Common Plant Communities

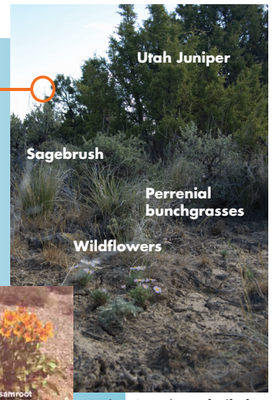
Across the West, only about one percent of the historic sagebrush steppe ecosystem remains nearly unchanged from its condition prior to European settlement. Perhaps the largest nearly undisturbed remnant of the sagebrush steppe ecosystem is at the 890-square-mile Idaho National Laboratory site, which has had minimal human influence since the 1950s. In recognition, the U.S. Secretary of Energy designated 114 square miles of the INL site near Howe, Idaho, as a Sagebrush Steppe Ecosystem Reserve.

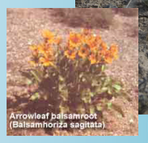
An ecosystem, like the Sagebrush Steppe Ecosystem, may encompass dozens of plant communities, each with a unique set of attributes. On the Reserve, eleven plant communities have been described; five of the more common communities are described here. Conservation management helps maintain plant communities and provides opportunities to study this unique ecosystem.

Bunchgrasses, like bluebunch wheatgrass, are common to nearly every plant community in the sagebrush steppe. Like many perennial plants, bunchgrass leaves annually die and regrow from the root system, the plant's crown growing larger each year.

Juniper Woodland

On the Reserve, Juniper Woodland communities are dominated by Utah Juniper. Big sagebrush and black sagebrush are often present, as are bunchgrasses, like bluebunch wheatgrass, Indian ricegrass and needle-and-thread grass. Common wildflowers include balsamroot and hawksbeard. Juniper Woodland communities are located near the foothills of the adjacent mountains.





Native Americans boiled roots, stems and leaves of arrowleaf balsamroot and drank the resulting tea for stomach pains and headaches. The ripe seeds were pounded into flour and its fleshy roots were often eaten raw or boiled.

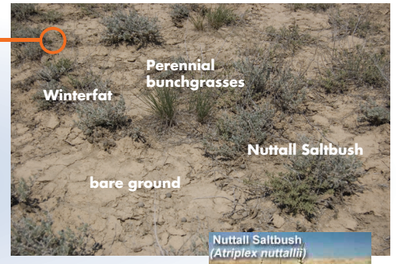
Sagebrush Steppe

Sagebrush Steppe is the dominant plant community and the namesake for the entire ecosystem. Wyoming big sagebrush and bunch grasses, like bluebunch wheatgrass, provide the majority of vegetative cover. This community also hosts cactus species, like prickly pear, and wildflowers.

Lupines and other members of the pea family comprise nearly 10 percent of the plant species in Sagebrush Steppe communities.

Salt Desert Shrub

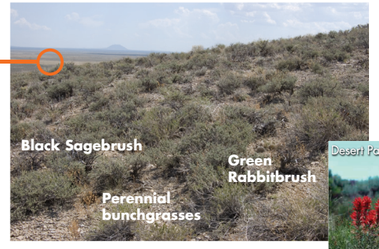
Shrubs in the saltbush family—such as Nutall saltbush, shadscale and four-wing saltbush—thrive in areas with high soil salinity. In the winter, these shrubs have a high nutritive value making Salt Desert Shrub communities excellent winter range for pronghorn antelope. Substantial patches of bare ground are a distinctive characteristic of this plant community.



Many saltbrush species, like Nutall saltbush, are dieceous with separate male and female plants, unusual for flowering plants.

Low Sagebrush

This community is dominated by shorter-standing sagebrush varieties, including low and black sagebrush. Low Sagebrush communities often contain green rabbitbrush, perennial bunchgrasses and wildflowers, such as Hood's phlox, paintbrush and fleabane.



Paintbrushes are hemiparasitic plants that photosynthesize on their own but exploit the roots of other plants for moisture, minerals and photosynthetic nutrients.