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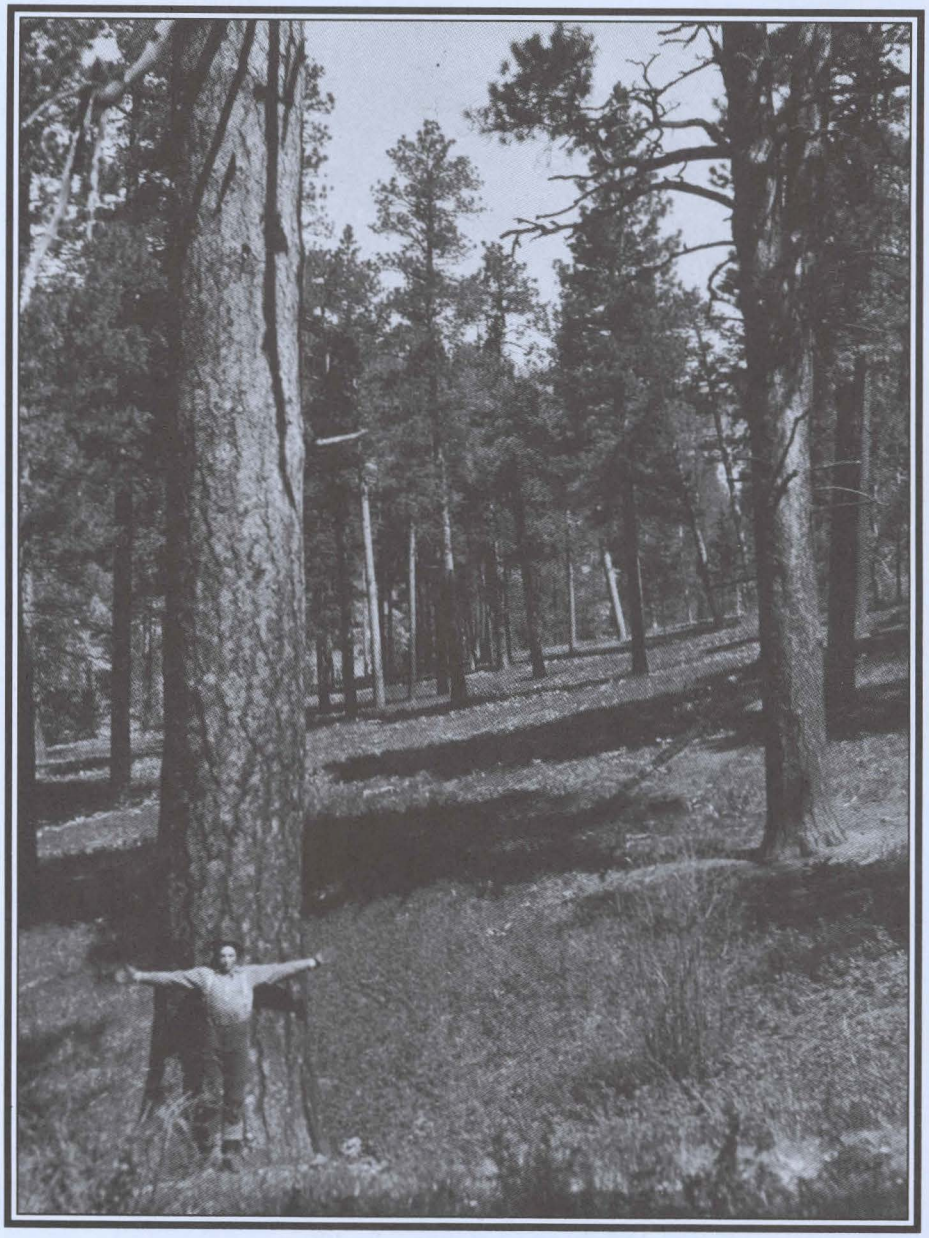
Forest Service

Intermountain Region

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Historical Vegetation on National Forest Lands in the Intermountain Region

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Preface

The enclosed publication, "Historical Vegeta
National Forest Lands in the Intermountain W
Ogle and DuMond is the culmination of a multip
effort to summarize an enormous amount of infor
concerning the presettlement vegetative ecology
National Forests in Utah, Nevada, Idaho, and Wy

We believe that this publication, if used, wi
valuable tool in aiding interdisciplinary teams for
plan revisions, the preparation of prescribed b
plans, adaptive management, describing environ
affects in NEPA documents and for monitorir
evaluating landscapes after either wildland or pres
fires.

The key, though, is that this publication must be
It is our hope that it will become a well-thumbed
reference for information relating to ecology (fire e
in particular), and that readers will use the ext
bibliography for more in-depth information.

Finally, it must be said that "Historical Vegetatio
"good-read," filled with historical anecdotes of wh
Intermountain Region's vegetative landscapes
like in the recent past.

Richard Adams
Director, Fire, Aviation and Air
Ogden, Utah

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Historical Vegetation on National Forest Lands in the Intermountain Region

Karen Ogle
Valerie DuMond

Introduction

Knowledge of the historic structure, composition, and range of variation in vegetation is essential for ecosystem management. This type of information does not readily exist for most forests but would be a useful reference at planning levels ranging from project to ecoregion (Bailey and others 1994). The ideal reference condition would have undisturbed ecosystems available for direct evaluation of historical and current conditions (Kaufmann and others 1994). Unfortunately, most ecosystems have been impacted and modified by humans and few pure or undisturbed systems are available for study (Swanson and others 1993).

As the Intermountain Region (which includes Nevada east of the Sierra Front, southern Idaho, Utah, and western Wyoming) enters a new era of Forest Plans, either in the form of amendments or revisions, such information would aid managers and line officers in their decisionmaking. Although this document is incomplete in its coverage of the vegetation across the Intermountain Region, it contains the best available information. Our purpose is to assist decision makers in understanding variability in vegetative structure and composition prior to Euroamerican settlement. Our work, however, also reveals large gaps of information that may preclude the use of historical accounts for ecosystem management in many cases.

Prior to establishment of the Forest Reserves in 1891, most of the Intermountain Region had undergone major changes in plant cover as a result of extensive timber harvesting, livestock grazing, and fire exclusion. The plant communities we see today, in most cases, do not resemble those present when the first explorers arrived in the early 1800's. Their fire regimes have also been altered, especially the low intensity, short-interval regimes. The differences are visible when the historic vegetation and fire regimes are compared to current conditions.

After the Lewis and Clark expedition in 1804-06, the number of explorers crossing the Mississippi River slowly increased each year. Many of these were U.S. Army groups, which the President had commissioned to look for routes for the railroad, and to make detailed descriptions and maps of the new territories. Because objectives of the groups varied for each expedition, their vegetative descriptions also varied. The data collected by the explorers, and the amount of historical data documented were never consistent.

To describe what was present before settlement, we conducted an extensive literature search (see Methods section). This search produced information from diaries written by early explorers, timber surveys from the early

1900's, research from the scientific literature (such as Ecology), government documents, and other sources.

We used the same type of information that Losensky (1993) used in *Historical Vegetation in Region One by Climatic Section.* His objective was to predict expected stand conditions in 1900, drawing from 1930's and 1940's timber inventory and survey-level data to describe vegetation by climatic zone. Although our sources were similar, our objective was to go back further in time and describe conditions when the first Euroamericans arrived. In most cases, this was between 1850 and 1870. Fire history research conducted in a few site-specific locations across the Region was also included to describe the changes in mean fire return intervals, and the associated changes in species composition and structure (Barrett 1984, 1987, 1988a, 1988b, 1994a, 1994b; Sloan 1994, 1996; Wadleigh and Jenkins 1996).

Application to Ecosystem Management

To practice sound ecosystem management, and provide for forest health, land managers need to know the historic range of variation on a given area. By using management activities to counteract practices that have disrupted natural forest processes, they can bring these sites back to a sustainable condition that is resistant and resilient to disturbance.

Two of the dominant themes of ecosystem management are ecological integrity and data collection (Grumbine 1994). Ecological integrity refers to conserving viable populations of native species, maintaining historic disturbance regimes, reintroducing native and extirpated species, as well as assuring historic ranges of variation within ecosystems. Data collection for ecosystem management includes research in the areas of habitat inventory, disturbance regime dynamics, baseline species and population assessment, and better use of existing data (Grumbine 1994). In theory, by identifying what the historic conditions were, the ecosystem can be reconstructed in number and type of species, and their spatial and temporal distributions. Land planners and managers can then use this reference condition to define target conditions for sustainability, or estimate how current ecosystems differ from historic ecosystems (Kaufmann and others 1994).

Historical Vegetation on National Forest Lands in the Intermountain Region is a beginning effort to determine a historical baseline for vegetation. It presents a qualitative compilation of data indicating structure and composition of vegetation at various times and locations in the Intermountain Region. Most of the information gathered is dated after European settlement, and much of it is a result of the degradation of the land in the early 1900's due to overgrazing and timber harvesting.

Some of the presettlement information is from the writeups of Western exploration and pioneer expeditions. By and large, these expeditions were funded by the U.S. Government, and included geologists, botanists, and cartographers who described the new territories, but these early descriptions tended to be vague, especially for species with noncommercial value. Later data includes the original Forest Service surveys of lands, and forest inventories, mostly in the form of stand tables for future timber harvest considerations.

The Intermountain Region was settled from 1850 to 1900, and lands were often significantly altered before indigenous species were documented. Early settlers rarely noted scientific names. Those names that were compiled were limited to palatable forage or commercial timber species. Some of the most valuable and accurate documentation of presettlement vegetation came from the areas settled last, such as remote portions of Idaho. Forested areas away from towns, roads, and rivers remained untouched until technology provided means to access and haul timber longer distances economically.

It has been proposed that analysts conduct an "ecosystem needs assessment" focusing on ecological conditions. One step in this process is evaluating ecosystem needs and capabilities by both coarse-filter and fine-filter analysis (Blahna 1995). A coarse-filter analysis is an analysis of aggregates of elements such as cover type or plant community; a fine-filter analysis is an analysis of components of aggregates, such as plant communities in a cover type, or species in a plant community (Kaufmann and others 1994).

This document serves as a coarse-filter analysis of historical vegetative conditions found over a broad area, compiled from the most relevant and available records. A fine-filter analysis would be difficult to justify. For one thing, it is not possible to establish a "hard" or stationary baseline in a dynamic natural system. However, land managers need a starting point, and our coarse-filter analysis should provide a foundation for further research and development. Furthermore, the costs of time, personnel, and money to produce a fine-filter analysis would be prohibitive. Although historical documents are limited in value by credibility of the source, small areas covered, and restricted timeframes of observation, they at present are our best records of historical vegetation.

Another factor that makes it difficult to justify a fine-filter analysis is the unknown impacts that Native Americans had on ecosystems before European settlers arrived. Prior to settlement, Native Americans burned the land in many areas to reduce hazards, and improve the habitat and hunting grounds for game species. This had a significant ecological impact on many landscapes. Powell (1879) mapped the Utah Territory; his map showed significant areas "destitute of timber on account of fires" (Powell 1879). These areas do not occur on upper slope positions, which would indicate lightning was the primary ignition source, but from valleys to mid-slope; this suggests anthropogenic sources. Native Americans used fire to hunt by driving or surrounding the principal grazing species of a region; in Utah this was deer and antelope (Pyne 1984). On arrival of the Europeans, the landscape was further altered, by running domestic livestock; clearing land for homesteads; harvesting timber for housing, mining, and fuel; and excluding and/or suppressing fire.

This document may be useful as a landscape management tool for classifying vegetation in the Intermountain West into three categories: Presettlement, Post-settlement, and a period spanning both. It may also be useful for adaptive management, where it is helpful to know historic vegetative conditions, even if we cannot establish a firm baseline. This adaptive approach is potentially costly in terms of gathering information and probability of failure (Lee 1993). In our case these costs are exemplified by our inability to establish a definitive vegetative baseline after extensive research was done on historical vegetation.

Finally, this document serves as a example for future coarse-filter data collection efforts. Data related to ecosystem management must be both relevant and economically feasible to collect; therefore, all resources must not be sunk into efforts to collect fine-filter data that may or may not support adaptive ecosystem management needs (Blahna 1995).

Methods

We acquired records from as many sources as possible; the largest was the National Archives and Records Administration at the Federal Center in Lakewood, CO. There, we were able to find Forest Service records from the Intermountain Region dating back to the early 1900's; many included the original land surveys and forest inventories. Other sources, dating back to the late 1700's, included libraries at four Utah universities (Brigham Young University, University of Utah, Utah State University, and Weber State University), the Historical Society of Utah in Salt Lake City, and the LDS headquarters in Salt Lake City. The Caribou National Forest Supervisor's Office in Pocatello, ID, also contributed.

Specific documents used included: Forest Service records, scientific journals, diaries of early explorers, government publications, and others. Once the data were located, numerical and written accounts were read and deciphered. An example of numerical data is stand tables from the Forest Service; narrative statements and lists of species are examples of written data.

Historical descriptions of the environment and native vegetation of the Intermountain Region were influenced by several factors. Some groups from east of the Mississippi River did not know what to expect on their journeys and were bothered by severe weather (relative to what they were accustomed to), lack of grass for their pack animals, and lack of potable water. Moreover, what they experienced was not comprehensive: the time required for an overland journey from Missouri to Oregon resulted in most travelers crossing the sagebrush grasslands during the late summer, after they had traveled through the Great Plains, one of the world's foremost grasslands. As such, they crossed the Plains during the peak of the growing season, and the sagebrush grasslands obviously suffered by comparison (Young and Sparks 1985). The exact remarks of one individual or another, are less important than the composite picture they may paint. For example, the first explorers through Nevada noted the sparse shrubby vegetation in the valley bottoms and the grassy areas above on the hillsides; consistency in their commentary would lead the reader to believe what they wrote was reasonably true.

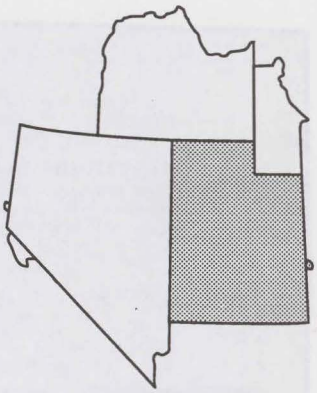
Determining the authors' exact locations presented a challenge, as the primary indicators are not only historical landmarks, but also names of rivers, mountains, and descriptions of the environment. In the case of the early explorers, such as the Dominguez-Escalante expedition of 1776, the names of rivers and mountains were created as they travelled. Consequently, the location of their observations can only be inferred broadly. Another difficulty in identifying locations occurred due to changes in National Forest boundaries and names of Forests. Many of the original Forests have been consolidated over the past century, and land exchanges have further confused the situation.

For our interpretation, we used Forest Service maps and documents to find geographical locations mentioned in the data. Narrative accounts typically included reference points, which aided in finding the location of data mentioned. Some locations in the narrative were found by Township, Range, and Section notation, which is the notation currently used on Forest Service maps.

There have been wholesale changes in plant names over the period we researched. Plant taxonomy was inconsistent depending on the source; in some cases a common name was used interchangeably with a scientific name in reference to the same species. Nearly all of the discrepancies between historical and current plant identification were eliminated by working with Wayne Owen, the Boise National Forest Botanist. He had records of many of the name changes, and searched the Internet for further clarification.

Throughout the project, we kept an account of the historical and current names (both common and scientific) for species, and changed terminology as it was found. This list was used to identify species, especially trees, when referenced in the text by names that varied temporally and regionally, and enabled us to reference them by scientific nomenclature. Scientific names in brackets in quoted descriptions are our additions. Modern place names are also bracketed when these differ from original names.

Our geographical coverage was extensive, but not complete. In some areas of the region, such as Nevada and parts of Utah, very little documentation was available about historical vegetative conditions. Areas of lesser commercial value were not documented as rigorously as those with timber or livestock forage. In Nevada, the available documentation was from the perspective of mining interests during the Comstock era; they needed mining stays, fuel wood, and forage for cattle to feed the miners. Because of the differences in types and extent of documentation depending on the location, there are variations in the amount of data available, and resulting geographical gaps in our document. Further research will need to be done to obtain a more comprehensive geographical coverage in the Intermountain Region.



Utah Forests

Background

In 1847 the Mormon pioneers brought with them to Utah, 2,213 oxen and 887 cows (Forest Service 1930). By the 1870's large numbers of sheep had entered the territory. The largest herds were in the Cache Valley. After approximately 1884 or '85 there were no longer any unoccupied ranges in central Utah. In 1887 there were 2.4 million sheep and 500,000 cows in the territory. Five or 6 years of constant competition on crowded ranges greatly reduced the vegetation cover. In regions where the intensity of overgrazing was cumulative, great areas of bare, dusty hillside replaced previously well-covered forage areas. Heavy summer showers poured down the gullies and flooded neighboring farm lands and even towns (Ensign 1887).

Except for part of the Uintah and Ouray Indian Reservation in the Uinta Basin, virtually all of the accessible range on forest reserve lands (and those destined to be included) had been almost completely denuded of vegetation. The native grasses and palatable browse species appeared headed for extinction. Aspen reproduction nearly came to a halt, except at the highest elevations, by the 1930's (Holmes 1990).

The native forests were cut to supply the needs of the early pioneers. Willows along the creeks furnished charcoal for gunpowder. The knotted and stunted mountain mahogany furnished fuel and articles such as drumsticks and flutes. Cottonwood and aspen were used in conjunction with rags for the manufacture of paper (Forest Service 1930).

Sawmills were built the first year after the pioneers came to Utah. By 1848 there were three mills in Mill Creek, east of Salt Lake City, and three in a canyon 10 miles north. By 1852, there were sawmills at City Creek, Cottonwood Canyon, Tooele, and Provo. In 1853, there were 100 or more mills in operation in various parts of Utah. Smith Brothers cut saw timber (about 1882) from Pine Valley near the Provo River, and ran the first drive of timber from the upper Provo River. The logs were landed near the mouth of Provo Canyon, where Smith Brothers had a sawmill. Ties were driven down the river every year thereafter until the 1890's. The largest drive was made about 1886, when approximately 350,000 ties went down the river (Forest Service 1930).

As soon as railroad connections with California and the Pacific Northwest were established, lumber from the coast was used; it was of higher quality yet had a lower price. By that time the most accessible stands in the Intermountain area had been greatly depleted. In 1927 there were 81 active sawmills in Utah. The annual cut fell from 25,709,000 bd ft to 7,623,000 bd ft in 1928 (Forest Service 1930).

Because the Mormon Church officially explored for suitable settlement sites, reports and diaries written at the time discussed the supplies of irrigation water, the quality of soil, and the amount and kind of native forage available. Where the soils and the moisture supply were favorable, wheatgrasses and giant ryegrasses predominated. On drier sites, sagebrush was proportionately more abundant, with considerable amounts of grasses in between shrubs. The plant cover was mostly a mixture of wheatgrass, rye grass, and sagebrush, except in marshy areas (Stewart 1941).

Stewart (1941) cited a report written by Powell in 1879 that described parts of the Great Basin. Of the Great Salt Lake drainage he said "near to the mountains the grass lands are fair, but have been overpastured and greatly injured. Out among the Basin ranges (on the west desert) little grass land of value is found." The east portion of the Great Salt Lake drainage area was the first grazing land occupied and when Powell wrote in 1879 it had been used for 20 to 30 years. He could already detect the deteriorating effects of unmanaged grazing.

A geologist named Gilbert, who studied the ancient shorelines of Lake Bonneville in 1880's, described (in Stewart 1941) the vegetative conditions he found. "The characteristic lowlands have a sparse growth of low bushes, between which the earth is bare, except scattered tufts of grass. Toward the north, and especially on the higher plains the grass is naturally more abundant and the bushes occupy less space, but the introduction of domestic herds favors the ascendancy of bushes." He observed the decrease of grasses and the increase of sagebrush and greasewood under heavy grazing.

Powell's 1878 expedition also documented the forested vegetation across most of the territory. Figure 1 is a reduced copy of the original map that was part of his report. The areas colored in blue are standing timber; green areas are irrigable lands, and tan indicates areas of timber burned by fire. Excerpts from his report shed light on the information detailed on the map (Powell 1879).

> Throughout the timber regions of all the arid lands fires annually destroy larger or smaller districts of timber, now here, now there, and this destruction is on a scale so vast that the amount taken from the lands for industrial purposes sinks by comparison into insignificance. The conditions under which these fires rage are climatic. Where the rainfall is great and extreme droughts are infrequent, forests grow without much interruption from fires; but between the degree of humidity necessary for their protection, and that smaller degree necessary to grow, all lands are swept bare by fire to an extent which steadily increases from the more humid to the more arid districts, until at last all forests are destroyed, though the humidity is still sufficient for their growth if immunity from fire were secured.
>
> A glance at the map of Utah will exhibit the extent and distribution of the forest region throughout that territory, and also show what portions of it are in fact occupied by standing timber. The area of standing timber [in blue] includes all of the timber, whether dense or scattered.
>
> Everywhere throughout the Rocky Mountain Region the explorer away from the beaten paths of civilization meets with great areas of dead forests; pines with naked arms and charred trunks attesting to the former presence of this great destroyer. The younger forests are everywhere beset with fallen timber, attesting to the rigor of the flames, and in seasons of great drought the mountaineer sees the heavens filled with clouds of smoke.
>
> In the main these fires are set by Indians. On their hunting excursions they systematically set fire to forests for the purpose of driving game. Only the white



Figure 1-



Figure 1—Map accompanying 1878 Powell Expedition report (Powell 1879).

> hunters of the region properly understand why these fires are set, it being usually attributed to a wanton desire on the part of the Indians to destroy that which is of value to the white man. The fires can, then, be very greatly curtailed by the removal of the Indians.

Ashley National Forest

Vernal Ranger District—Timber harvesting began with the advent of the settlers in the mid 1870's. In 1881, a mill operated on Dry Fork Mountain. For many years it supplied the lumber for builders in the Ashley Valley. This mill was relocated to Red Pine Setting and later to Oaks Park. A sawmill was located at Government Park for the construction of Fort Thornburg, which was established by the U.S. Army in December, 1881. A mill was located at Windy Park in 1898, but was removed when the Ashley NF was created (Fazio 1967).

Whiterocks Ranger District—Some ponderosa pine from Cart Hollow was used in the construction of Forts Duchesne and Whiterocks about 1880. A wagon road was built in Bowles Canyon and a mill set up in the area now called Mosby Park about 1907. Another wagon road was built in Mill Canyon and a mill set up there. Only a small volume of timber was used locally. Loggers generally "high graded" the accessible stands. In 1920 logging operations penetrated deeper into the lodgepole pine stands. A wagon road went up Grouse Creek Canyon into the vicinity of Paradise Park and set up a mill about 1 mile south of the Park. Some logging was taking place in Pole Creek Canyon about the same time. The first sheep grazing started in 1902 (Worf n.d.).

Based on tree ages and the stories of the settlers, most of the large fires that burned many sections of land at a time ran unchecked in the 1880's. These fires resulted in hundreds of acres covered with stagnated stands of doghair lodgepole. Native Americans burned off the land in an effort to get rid of the bears (Fazio 1967).

1909 Reconnaissance—In 1909, S.S. Stewart surveyed the east end of the Forest; a portion of the southern drainage west to Marsh Peak and a narrow strip, 6 to 9 miles wide, along the southern boundary extending west to the divide between Dry Gulch and East Fork of Lake Fork of the Duchesne River.

The Forest was divided into blocks and described in some detail (Stewart 1911):

> Cart Creek and east to the Forest boundary - Practically all of this block was burned over about 30 years ago. The present stand on burned areas is a mixture of excellent sapling reproduction 10 to 25 feet high and patches of the original growth in the form of poles 5 to 12 inches in diameter. Aspen plays a prominent part in restocking much of the burned-over country and occurs in considerable areas where reproduction of timber species is practically absent. A couple areas near the divide between Little Brush Creek head and Cart Creek were not burned and comprise all the merchantable saw timber. The remainder of the area is covered with sagebrush, aspen or supports isolated and park like stands.
>
> The Little Brush Creek block comprises 23,700 acres of timber land in the lodgepole type. The young stands in this block are plainly the result of old fires. Past fires have encouraged the lodgepole and aspen to come in over areas apparently too dry to mature the present sapling and pole stands, hence such

areas now brush or barren will probably always remain so. In approximately sections 12 and 13, T. 1 N., R. 21 E. is the only old burn with little or no reproduction. Elsewhere reproduction is dense and thrifty.

The Big Brush Creek block has been culled or burned over. The burned areas (75% of the total area) are generally restocked with seedling and sapling lodgepole, the latter ranging 10 to 20 feet high, thrifty and not crowding except in very few instances. The virgin stands back near the headwaters contain considerable mature timber, spruce and lodgepole. Light ground fires have covered considerable areas, burning the bark about the base and exposed roots. Considerable area was culled years ago, mostly by shingle mills, hence only the choicest trees were taken.

The Ashley block includes the area east of Sim's Peak to Taylor Mt. and north to the old Government road. Engelmann spruce and lodgepole make up the stand. The stand at present is about normal, undergrowth composed of spruce and balsam reproduction. Farther down the basin south and east of Trout Peak, the stand is more or less irregular, owing to old burns and dry southern slopes. South of the Government road is a large area between Taylor Mt. and Sim's Peak that has been burned over repeatedly resulting in irregular even-aged stands ranging from seedling to large stages. Aspen is everywhere prominent over recent burns and lodgepole is reestablishing itself, though generally scattered, averaging one or less per square rod.

The area around Mosby Mt. and the lower portions of Dry Fork are part of the Dry Fork block. It has been pretty generally burned over in the past and supports a scattered or open stand of yellow pine, Douglas-fir, spruce and lodgepole. South slopes and exposed ridges or flats are covered with sagebrush and some juniper. Aspen is abundant throughout the area.

Local authorities state the most widespread and destructive fire, covering the greater portion of four townships (in southeast portion of the Forest) occurred in 1879. Subsequently numerous smaller fires have run over much of the same area as well as other portions of the Forest. Since the area has been placed under the administration of the Forest Service, their occurrence has been rare and only slight losses sustained. As to the causes of fires, the blame may be shouldered upon Indians, hunters, settlers, campers, etc.

1910 Reconnaissance—In 1910, L.E. Hitchcock surveyed portions of the Forest and briefly described stand conditions. He frequently mentioned the burned-over stands. The steep portion of the Uintah River drainage was badly burned and very little merchantable timber remained. The southern part of the area drained by Pole Creek was badly burned and heavy reproduction had taken over the area. The area east to the divide between Whiterocks Creek and Dry Fork, west to the main divide between Farm Creek and White Rocks, south to the Forest boundary, and north to the end of the gorge was partially burned leaving patchy reproduction. The western half of this area was mostly burned-over with thick lodgepole reproduction coming in. Hitchcock (1910) noted the presence of fire scars on trees on the south end of the block, though evidence of past fires was found throughout.

Lake Fork Working Circle—In 1924, Blood wrote a management plan for the Lake Fork Working Circle. The working circle included the West and East Forks of Lake Fork, Dry Gulch drainages, and their tributaries. Timber harvest within the circle started in the 1880's when the Indian Department (now BIA) had a mill located in Dry Gulch (at the location of the old Ranger Station). This mill removed most of the ponderosa pine along Dry Gulch. Little attention was paid to silvical systems. The objective was to remove the best trees and leave the others. So much was cut that the 1924 management plan suggested that all cutting be discontinued. The management plan noted several times that there were large tracts of old burns and that the dead

timber presented both a fire hazard and a menace to the green timber stands. The forest was composed of a mixed stand of the following species (Blood 1924):

	Percentage
Ponderosa pine	14
Douglas-fir	3
Lodgepole pine	33
Engelmann spruce	39
Subalpine fir	1
Burned (all species)	10

Ponderosa pine grew in a strip along the Forest boundary, defined on the north by the 8,600-foot contour. It extended from Dry Gulch on the east to approximately the 8,500 foot-contour on the divide west of Lake Fork. Stands were open and irregular due to soil and/or topography. In some places lodgepole was coming in under the ponderosa along the upper limits of its range. Blood noted, however, lodgepole was possibly replacing ponderosa. Reproduction was occurring in old harvest areas and along small intermittent streams where seeds had been carried away and covered with silt by spring floods. In those areas, reproduction was in dense groups, varying in size from 3 year-old seedlings to large saplings (Blood 1924).

Douglas-fir was usually found in pure stands along the south slopes of the lower creeks, sometimes occurring as a mixed stand with lodgepole. The pure stand was characterized by an abundance of mature trees with little underbrush. Little reproduction was noted except on old burns, where it was coming in with the lodgepole (Blood 1924).

Lodgepole pine was found in pure stands and in mixture with spruce. Over most of the area, lodgepole was found in stands ranging from small seedlings to mature and overmature trees. Along the benches and lower slopes of the creeks between 8,500 and 10,000 feet, the trees could be as big as 20 inches d.b.h. and 60 to 70 feet in height. There were thousands of acres of old burns within the circle that were restocked with dense stands of lodgepole. Little cutting occurred in this regeneration until 1924.

Spruce were composed of all aged-trees from seedlings to overmature. Individuals were somewhat small (12 to 18 inches d.b.h. and 60 to 80 feet tall), but some trees occasionally reached a height of 100 to 120 feet and 40 inches d.b.h. Reproduction was usually good, except on rocky sites (Blood 1924).

Dixie National Forest

Timber Harvest—The day after settlement at Parowan (September 1851), an exploration company found sawtimber about 6 miles up Center Creek. A road was built, and on January 27, a group hauled 26 loads of timber from Parowan Canyon. In the winter of 1851, men were sent to Ash Creek (Pine Valley Ranger District) from Parowan and Cedar City to cut ash lumber. When Harmony was settled in 1852, six teams hauled pine logs from Parowan and Cedar City Canyons to Harmony, while the Harmony area provided ash for Cedar City and Parowan. Before the end of 1852, the teams hauled 51 loads of lumber from Parowan (Hinton 1987).

Regulated harvesting began on February 23, 1856, to control cutting in Kanarrah Creek Canyon for the benefit of the Ft. Harmony inhabitants. For the first 40 years of Pine Valley's history, lumbering was a major source of income. During the winter, men went into the hills and logged, making slides in the snow to skid the logs to the foot of the mountain. Robert Gardner, who had experience lumbering at Mill Creek in Salt Lake City, found Pine Valley covered with large pines (Hinton 1987). The hills in almost every direction were covered with pines and cedars, and in some places there were groves down to the level land where teams could pass through without obstruction. At the height of the lumber industry at Pine Valley, seven mills operated simultaneously. By the 1860's, local demand resulted in the depletion of Pine Valley's timber. The timber in Forsyth Canyon and Lower Canyon was cut over, but Main Canyon had suitable trees left (Hinton 1987).

The opening of the mines at Pioche, NV, revitalized the timber business for a time. The industry slumped in the 1880's when 25 families left, but was sustained by the timber demands for building the temple in St. George. Pine Valley could not supply these needs, so lumber was cut from Mt. Trumbull. By the end of 1896, mining was considered a dead industry. In the absence of good roads and freighting capability, each area developed a local lumber industry. The first sawmill in Panguitch Valley was set up near the mouth of Panguitch Creek in 1874. A second mill was established in 1875 near the mouth of Butler Creek. In the next 25 years other mills were set up at Mammoth Creek, Hillsdale, Smith Canyon, Dave's Hollow, Williams Bottom, Flake Bottom, Little Creek, Clear Creek, and Sanford Canyon (Hinton 1987). During the pioneer period, small sawmills operated in virtually all the principal timber areas.

Grazing—The first pioneers brought livestock, principally milk cows and work stock. As the pioneer lumber industry decreased, some men envisioned wealth in the livestock industry. Southern Utah's cattle industry began with the settlement of Parowan in January 1851. The settlers brought 368 oxen, 100 horses, 12 mules, and 146 cows. On September 5, 1852, George Smith reported there was a herd of approximately 500 cattle and horses in Parowan (Hinton 1987).

The Mormon settlers considered animals ranging too far from the villages to be in danger of being stolen by Native Americans. It was nearly 15 years after settlement at Parowan before they began to make much use of the pastures in the higher mountain ranges. As the number of animals increased and the closest lands were overgrazed, the herds were driven farther and farther away from the towns to find pasturage. At Parowan and Cedar City, the need for more feed for their cattle drove ranchers to venture into the mountains. There they found, at the heads of canyons and in the open spaces on mountain tops, natural pastures that furnished feed for milk cows during the summer months. The cool, clear springs were ideal for the processing of cheese and butter. Each family built a log house and corrals and returned to the same place year after year (Hinton 1987).

The grazing of dairy cows was followed by grazing of beef cattle and then sheep. The grass was lush and tall. In places it was even mown as hay. At the time of settlement, there were heavy stand of grass in most localities. In the early days of stock raising, the natural grasses and shrubs seemed to be able

to support an unlimited number of livestock, so the herds grew in size. Soon the mountain range began to show the effects of overgrazing (Hinton 1987). No grazing regulation existed and since agriculture and livestock produced 95 percent of the income in southern Utah, no one was voluntarily going to reduce herd numbers.

In 1872, the second Powell expedition made its way from Kanab to the mouth of the Dirty Devil. The explorers observed that the country was covered with fine grass. They judged the Aquarius Plateau a perfect paradise for the rancher (Hinton 1987). The Upper Potato Valley (15 miles southwest of Escalante) in 1875 had an estimated 10,000 head of cattle and 10,000 sheep (Hall and Cottam 1955). All vegetation types suffered a great reduction in forage production; some sites underwent type conversion. The upland meadows became completely dominated by shrubs of low palatability and junipers rapidly invaded this newly created shrub zone (Hall and Cottam 1955). The lower montane shrub belt that had surrounded the Potato Valley and furnished considerable browse forage for livestock was largely replaced by thick stands of small ponderosa pine. Mature aspen forests long overgrazed by livestock and deer showed little reproduction and were in danger of disappearing. A huge human-caused gulch with an average depth of 39 feet and width of 69 feet extended throughout the entire length of the valley (Hall and Cottam 1955).

As prosperity continued from 1875 to 1890, livestock herd sizes increased. Under pressure the range began to deteriorate and washes and gullies and sagebrush were more common. In 1883, Edgar Beecher Bronson complained that cattle in Utah were increasing at a rate that made sure the ranges would become so badly overcrowded that profitable breeding and beef fattening would no longer be possible (Hinton 1987).

When Escalante was settled, the settlers brought livestock. The first large herd was brought in 1878. Soon the livestock industry was bringing in 90 percent of the cash receipts. Escalante residents had the range to themselves until 1896, when 6,000 head were brought into the area. Over the next few years 13,500 head drifted in. From 1892 to 1900, 30,000 to 35,000 head of cattle and horses grazed the Aquarius Plateau country (Hinton 1987).

Sheep began to compete with cattle on the open range when 2,000 head were brought into Escalante in 1880. In the early days of the sheep industry, there was little or no conflict with the cattlemen because the stockmen from Escalante, Boulder, and neighboring towns divided up the range. Certain districts were designated for use by sheep or cattle. This plan worked until transient sheep bands arrived, then no attention was paid to the local agreements. Thereafter, there was a free-for-all rush to get the best feed first. Under these new conditions, overgrazing, overconcentration, and excessive trailing of stock became largely responsible for the rapid range deterioration.

Overgrazing practices depleted the range and almost ruined the watersheds in many areas. By the early 1890's there were frequent reports of overstocking and overgrazing. Beginning in 1892, there was a severe drought and hundreds of stock starved to death. After the drought, the range never seemed to revive. Beginning again in 1895, and lasting into July of 1896, there was another severe drought. In July 1896 it began to rain and many bad floods ensued until fall. The range condition was probably responsible for part of the flooding and erosion damage. Range deterioration continued again between 1900 and 1905 (Hinton 1987).

Early Botanical Description—In 1891, C. Hart Merriam, M.D. took notes on horseback while traveling across the deserts and desert ranges of the southern part of the Great Basin. The following is a list of the plants he found on or near the Dixie NF (Merriam 1893):

Berberis fremonti
Purshia mexicana
Franseria eriocentra
Tetradymia canescens
Quercus havardii
Cercocarpus ledifolius
Peraphyllum ramosissimum
Artemisia tridentata
Krascheninnikovia lanata
Quercus gambelii
Pinus monophylla
Juniperus osteosperma
Pinus ponderosa

In the Juniper Mountains (between Meadow Creek Valley, NV, and Shoal Creek, UT) Merriam found the most extensive juniper forest covering the rolling plateau along the boundary between Utah and Nevada. It reached an elevation of 5,800 feet on the east side of Meadow Creek Valley all the way across to Shoal Creek on the border of the Escalante Desert in Utah. This continuous juniper forest was more than 20 miles in breadth without a break and was mixed with very little nut pine. On the Shoal Creek side, it descended to 6,000 feet. Juniper was abundant in a broad zone around the base of Pine Valley Mountain and stretched northwest over the Upper Santa Clara Valley forming a sparse forest on the hillsides until it reached the Shoal Creek area where it joined the continuous forest.

Mountain Meadows—Mountain Meadows in southwestern Utah was used by many explorers and California immigrants because of its abundant forage and water.

As early as 1842 J.C. Fremont commented on the conditions:

> We found here an extensive mountain meadow, rich in bunchgrass and fresh with numerous springs of clear water, all refreshing and delightful to look upon....The meadow was about a mile wide and 10 miles long bordered by grassy hills and mountains. (Cottam 1929)

Later in 1851, Parley Pratt, arrived and described the meadow:

> Some 1000 or 1500 acres of bottom or meadowlands were spread out before us like a green carpet richly clothed with a variety of grasses, and possessing a soil both black, rich and quick-being a mixture of sand, gravel and clayey loam, and the decayed vegetation of ages. It was everywhere moistened with springs and would produce potatoes, vegetables and small grains in abundance without watering. The surrounding hills were abrupt but rounded off, presenting a variety of beautious landscapes and everywhere richly clothed with the choicest kind of bunchgrass and bordered in their higher eminences with cedar and nut pine sufficient for fuel. (Cottam 1929)

The entire valley as reported by Fremont in 1844, and by Pratt in 1851, was grass-covered. Two types of meadow existed: (1) a wet wiregrass meadow that surrounded numerous small springs in the lower parts of both the north and south valleys, and (2) a drier grass or prairie meadow that covered the divide and the low foothills sloping gently upward, both east and west from the spring-fed bottoms (Cottam and Stewart 1940).

The following is a list of the plant species that occupied the wiregrass meadow and the dry or grass meadow (Cottam and Stewart 1940) prior to settlement in 1862:

Wiregrass Meadow
Juncus balticus
Eleocharis palustris
Juncus bufonius
Agrostis palustris
Poa pratensis
Medicago lupulina
Salsola iberica
Achillea millefolium ssp. *lanulosa*
Lactuce serriola
Taraxicum officinale
Equisetum laevigatum
Juncus xiphioides
Carex nebraskensis
Phleum pratense
Polypogon monspeliensis
Melilotus alba
Artemisia ludoviciana
Lactuca tatarica ssp. *pulchella*
Sonchus asper

Prairie Meadow
Carex praegracilis
Carex stenophylla
Carex douglasii
Pseudoroegneria spicata
Pascopyrum smithii
Pleuraphis jamesii
Sporobolus cryptandrus
Leymus triticoides
Elymus elymoides

Contrast Pratt's account of the area in 1851 with Bancroft's description in 1877.

> The luxuriant herbage that clothed it 20 years before had disappeared; the springs were dry and wasted and now there was neither grass nor any green thing save here and there a copse of sagebrush or scrub oak that served but to make its desolation still more desolate. A severe drought lasted a decade that began in the early 70's and culminated in a disasterous flood in the spring of 1880. (Cottam 1929)

The primary cause of the permanent destruction of Mountain Meadows was its overuse by humans. Old settlers claimed the Region was overgrazed. The hillsides and deserts that were once "richly clothed with the choicest kind of bunchgrass" soon gave way to brushland or bare spaces (Cottam 1929). By 1864, the town of Hamblin was established near the northern limits of the valley. Thirty families built homes, and sheep and cattle soon grazed over the entire valley and the surrounding mountains (Cottam and Stewart 1940). Trails were beaten through the meadow as early as 1871, and deep washes ate their way into its lower margins. A decade-long drought in the 1870's increased the deterioration of forage caused by severe grazing. When the flood of 1880 came, practically the entire wash, as it appears today, was excavated within the brief period of 36 hours. The drainage over this historic spot became perfect, and the transformation from meadow greens to desert grays was rapid and complete.

Old settlers declared that plant succession leading to climax was very rapid after the wash appeared. The most vigorous pioneer was lupine. Sagebrush was the first and principal invader of the drained wiregrass meadow. The great volume of rabbitbrush now found on these bottoms is the result of more recent invasion. The substitution of sagebrush for grass in the shallow valley and on the gently sloping foothills was undoubtedly a gradual process. It followed the effects of drainage and forage depletion brought on by drought and by excessive grazing.

Since no relict areas of the prairie meadow exist today, the local distribution and dominance of species in 1862 may only be inferred from what is known of their ecology and from testimony of a few old inhabitants. As judged from similar sites, the deep well-drained soils of the valley were probably dominated by *Elymus* and *Carex*, while the foothills with shallow soils supported *Agropyron*, *Oryzopsis*, *Bouteloua*, and *Hilaria*. The disappearance of the prairie vegetation and its replacement by sagebrush are directly traceable to human influence and not to climatic changes as some ranchmen contend. This evidence is supported by the additional grass on areas that have been protected from heavy grazing. When C. Hart Merriam came through the area in 1891, he classified the area as a true sage plain (Cottam and Stewart 1940).

In 1864, there were 1,078 acres of juniper on the north drainage; by 1934 the area had grown to 6,272 acres, an increase of nearly 500 percent. Six times as many trees were thriving in 1940 on the original juniper areas as in 1864, and 20 times as many in the valley. The junipers that migrated into the meadows did so around 1900. The failure of the junipers to invade the grass hillsides of Mountain Meadows prior to 1862 is best explained by a combination of grass competition and periodic fires. Following the almost complete disappearance of grass and fire, the invasion of juniper has extended to both higher and lower elevations and on north and south slopes. These facts seem to reduce the probability that climate was a factor in plant succession (Cottam and Stewart 1940).

Sevier National Forest—In 1910, the Forest Supervisor of the Sevier NF wrote a letter to the District (Regional) Forester. The letter described the timber available for use by a railroad company (Forest Service 1910a):

> ...it seems that probably the only compact body of timber readily available and accessible to the proposed railroad, would fall in Tps. 37 and 38 S., R. 7 W., and the two west tiers of Sections in Range 6 W., embracing about 30,000 acres of public Forest land, which would include the country south of Mammoth Creek, bounded on the West by Tommy Creek and the Black Lava Beds running through the eastern part of Tps. 37 and 38 S. in Range 8 W; going South to the Pink Cliffs along the boundary on the south end of the Forest, then following the Forest Boundary N.E. back to Mammoth Creek. I would judge that perhaps 10% of the stand consisted of Black Balsam (*Pinus contorta*), from 10-15% Douglas-fir, possibly 8% Engelmann spruce; the remainder would be Western Yellow Pine [Ponderosa pine].
>
> On the East Division of the Forest an area not so accessible as that on the West Division might be recommended. It would embrace unsurveyed Tps. 37 and approximately the North half of 38, in Ranges 4½ and 5 W., embracing about 40,000 acres. The area might be described as bounded on the West by the Forest Boundary, on the South by Kanab Creek, on the East by the East Fork Creek, and on the North by Bluefly Creek. On this area the stand consists in about equal parts Black Balsam, Douglas Fir, and Western Yellow Pine, with a good mixture of Engelmann spruce at the higher altitudes.

An inspection in 1909 (Butler 1909) produced estimates of available sawtimber on the Cedar City RD; these are given in tables 1 and 2.

Powell National Forest—In 1922, the Forest Service developed a policy for managing timber on the old Powell NF. A description of the timber is found in a statement for the Washington Office (Forest Service 1922c):

> Juniper and pinion occurs in a broad belt along the boundary with yellow pine immediately above in a similar belt approximately 4 to 5 miles wide. Douglas-fir and spruce, both Engelmann and Colorado blue spruce, occupy the high plateau country and north slopes at high elevations. Aspen is found generally throughout the Forest at the higher elevations. The stands in all types generally are uneven-aged. Reproduction follows readily in openings made by windfalls, fires or from other causes. Probably less than 10% of the timbered area shows evidence of old fires and these are mainly in the spruce type and restocking in excellent shape. No fires of any consequence have occurred since the Forest has been under administration.
>
> The Black Hills beetle [Mountain pine beetle] caused heavy losses in yellow pine approximately 12 years ago and an epidemic seems to be approaching again. Effort is being made to get sawmill operators and other purchasers to remove the infested trees under free use or at a very nominal stumpage price.

Fishlake National Forest

Pahvant, Round, and Juab Valleys—When the settlers arrived, the foothills were covered with grasses, scattered junipers (*Juniperus osteosperma*), and sagebrush. The grass of this region was probably *Agropyron spicatum* and *Poa secunda*. In level areas among the foothills, western wheatgrass (*Agropyron smithii*) was common. In 1887, Samual Pitchforth wrote to the Deseret News and stated there were "hundreds of thousands of sheep roaming the hills and finding pasturage in the rich mountains of the southern counties" and that "year after year their number increases" (Christensen and Johnson 1964). He stated that Juab County was a natural winter range for sheep.

Table 1—Sawtimber estimates on the Dixie National Forest (Cedar City RD) for 1909.

		Aspen			Cedar			Pinon		
Unit #	Acres	Average TPA	Average d.b.h.	Height (ft)	Average TPA	Average d.b.h.	Height (ft)	Average TPA	Average d.b.h.	Height (ft)
1	18,560				40	8	12	35	6	14
2	23,680				25	8	14	20	9	16
3	8,320				20	8	9	17	9	10
4	26,240	28	6	30						
5	5,760	40	7	45						
6	13,680	60	8	40						
7	45,440	30	8	40						
8	6,400				15	12	15	11	12	14
9	8,960				18	9	10	32	8	8
10	6,400				21	8	12	12	7	11
11	11,520				19	10	11	16	12	17
12	42,880				8	14	30	10	13	25
13	4,480	38	7	30						
Total	222,320									

Table 2—Sawtimber estimates on the Dixie National Forest (Cedar City RD) for 1909.

		Yellow pine			Douglas-fir			Spruce			Balsam		
Unit #	Acres	Average TPA	Average d.b.h.	Height (ft)	Average TPA	Average d.b.h.	Height (ft)	Average TPA	Average d.b.h.	Height (ft)	Average TPA	Average d.b.h.	Height (ft)
1	9,600	2	14	40	1	14	40						
2	2,560	6	14	40	2	13	35						
3	15,360	4	13	37	2	12	30	6	10	50	10	12	40
4	10,880	3	20	80				10	10	50	15	9	35
5	3,840	8	15	50				20	9	40	20	9	35
6	5,120	15	15	50									
7	10,240							40	11	65	35	12	40
8	17,280	3	17	70	7	15	60	10	12	70	8	12	40
9	29,440							40	11	65	35	12	40
10	14,720	6	16	60	3	17	75	2	10	60			
11	48,640	11	16	60	4	17	75	3	13	75			
12	7,680	11	19	75	2	13	35						
13	26,880	17	10	30									
14	35,200				4	16	70	12	12	70	5	13	50
15	12,800	5	17	70	2	16	70	3	12	70			
16	16,640	2	15	50	20	16	70				7	14	60
17	6,400	9	15	40									
18	5,120	7	12	40									
19	21,120	7	8	25									
20	4,480	12	9	30									
21	12,800	9	10	30									
22	4,480	10	18	70									
23	9,600	9	14	40	4	12	30						
24	23,040	4	9	30	7	16	75	3	12	70	6	10	40
25	49,280	3	15	60	5	14	60	4	12	70	3	14	65
Total	403,200												

Juniper was common in Pahvant Valley in the days of the early pioneers. Written records indicated an adequate supply of fuel along the valley's eastern border. Descriptions by P. P. Pratt and Jules Remy indicated that the juniper stands must have been mostly open and mature (Christensen and Johnson 1964). Although some small patches may have been located in lower parts of the valley, most of the junipers were restricted to the hills, but were lower in density than those found today.

The extent of the invasion was determined by comparing the vegetation descriptions of 1870 survey lines with the vegetation currently growing along those lines. In T. 20 S., R. 4 W. the line between sections 30 and 31 was described as being covered with grass and sagebrush. Now junipers and oaks are prominent. Between sections 16 and 21 of T. 21 S., R. 4 W., sagebrush was listed as the vegetation type in the survey records (Christensen and Johnson 1964). This line is covered now with juniper. General observations indicate that junipers are reproducing rapidly in both newly invaded areas and old stands.

Sevier River Area—In 1853-54 Captain Gunnison led an expedition of the Great Basin looking for a railroad route to the Pacific Ocean along the 38th and 39th parallels. Lt. E.G. Beckwith wrote a report, and portions allude to the kinds of vegetation he encountered. Beckwith wrote, "the summit of the Wasatch Mountains was a finely-grassed region, but entirely unfit for cultivation. The extensive valleys of the upper Sevier River and Sevier Lake, divided by the Un-kuk-oo-ap Mountains (Canyon Mountains), were vast artemisia plains, with a dry, sandy soil, quite uninhabitable, except on the grassy bases of the mountains, where an occasional mountain stream had a limited supply of water" (Beckwith 1855).

At latitude 38°45'36", he noted the vegetation around their camp and the region (Beckwith 1854):

> ...encamping at sundown at the mouth of a beautiful ravine of abundant grass, with fine groves of aspen on the hillsides for our campfires. The hills and valleys in every direction sustain the character of the last two days, in beauty and in the luxuriance of the grass, and absence of large trees. The labor of preparing the road, though considerable in removing scrubby oaks, pines, cedars and rocks...
>
> The Indians represent their cattle and sheep to be in superior condition, and in passing through the lower settlements in this territory they were so represented. A fact which bears directly upon the grass on this route.
>
> The width of the Sevier River valley is 4-7 miles, and its length 50-60 miles, without a tree, and with but little vegetation of any kind, even the sagebrush was thin and scattered.
>
> Sage grows luxuriantly in this mountain valley [inside the Canyon Mountains], which we followed for 10 miles and passed easily over the mountain lying west of it to the valley of the Sevier Lake. This range is finely covered with grass quite down to the sage plains, and is dotted with a growth of small cedar and oak, and is a fine pastoral district.

Manti-LaSal National Forest

In 1911, the Forest was surveyed in 1911. Survey results and components were published by Peterson (1971). Sections of his work follow:

> **Subalpine Type**
>
> A large portion of the La Sal range consists of Engelmann spruce, subalpine fir, Douglas-fir, ponderosa pine, aspen, cottonwood, oak, and white fir. Spruce and

subalpine fir grow together, but fir excels in range. Spruce is able to replace fir and form pure groups. The biggest trees are 80 feet tall and 2 feet in diameter. The average is 60 feet tall and 18 inches in diameter. The fir equals this average, but does not approach the maximum of the spruce. Both are regenerating only where openings occur from small fires. Douglas-fir is found in all parts of this cover type. Large trees were seldom seen.

Ponderosa pine is confined to gulches, except on the south slopes of South Mountain where a patch of 200-300 acres appears west of Pole Canyon. Two other large stands appear above the 9,000 foot line on Hop Creek.

Aspen appears in clumps and strips among the conifers and indicates restocking of burns and windfalls.

Oakbrush Type

Oakbrush occupies the southern exposures shunned by other species.

Ponderosa Pine Type

This type consists of ponderosa pine, cottonwood, oak, and aspen. Pine stands are very open and patchy, and a number of grassy parks are included in these areas. The pine is mature and some of it is very large, trees of 4-5 feet in diameter were reported though it is more common to see 3.5 feet. Almost all are fire-scarred. The area near Sinbad Valley has trees that are over 85 feet tall and 30 inches in diameter. Reproduction is almost absent on account of constant grazing and repeated light fires.

Woodland Type

This type consists of pinyon pine and Rocky Mountain juniper.

Economic Types Within Proposed Boundary

	Acres
Merch timber	34,506.2
Nonmerch timber	21,891.0
Burns	128.0
Woodland	34,127.8
Cultivated land	102.4
Cut-over land	563.2
Open grassland	51,030.8
Bald above timber	10,393.0
	152,643.0

Merch timber	Within boundary	Outside boundary	Total
		Acres	
Pine	19,148.8	9,600.0	28,748.8
Spruce	15,357.4	3,993.6	19,251.0
Total	34,506.2	13,593.6	47,999.8

When the first settlers arrived, the country was grass-covered. Grass grew thickly and "up to the horses' bellies" as commented by the engineers who marked the stateline. Every stream flowed continuously and was thickly covered with willows, cottonwood, and aspen. The country was heavily grazed by cattle and sheep. The sheep killed a great deal of the oak in the woodland belt around the mountains and girdled the aspen by biting the bark.

The forest cover of the Blue Mountains on the north slopes of the gulches near their heads bear a heavy stand of Engelmann spruce, subalpine fir and some scattering of Douglas-fir. The south slopes are open grassland or dense quaking aspen. At elevations below 9,000 feet, ponderosa pine gets to be 100 feet tall and average 12-18 inches in diameter. Elk Ridge is covered with a heavy stand of pine.

Another large stand of pine grows on the southeast end of the Blue Mountains, which lies in the foothills. It extends from the base of the mountains down Johnson and Recapture Creeks and follows the edge of the mountains as far as the South Fork of Montezuma Canyon. The gulches heading on both sides of Elk Ridge have spruce and subalpine fir on their north slopes in exactly the same manner as Blue Mountains. The ridges of the higher mountains are covered with grass and scattered brush. Reproduction is poor for all species, including the aspen.

Grass-covered slopes are gullied due to heavy sheep grazing. During the 1920's, the La Sal suffered some of its worst overgrazing. On some of the hardest hit allotments, even the hardiest browse plants showed little evidence of growth. Grazing permit authorization persistently ran ahead of demand, thus encouraging even heavier grazing.

Numerous small (up to 2-3 acres) fires have occurred in the mountains. They have burned more in the brush than the timber. The pine is fire-scarred, some enough to be partially girdled. Utes set big fires years ago in revenge for being driven out by the white settlers. This may account to some extent for the great bare southern slopes on the mountains, although evidence of such burning such as extensive burnt blowdowns was nowhere seen. Native Americans are said to have burned certain areas to flush out game, but these fires don't appear to have been extensive or by general standards destructive. The dry summer of 1900 resulted in one important fire on the north slope of the Blue Mountains beginning in late July and burned into the first week of August.

The first mill was set up in the La Sals in 1881. At least four other mills were operated on the La Sals prior to 1900. The first mill in the Blues (Bull Dog Canyon) started operation in 1887. Sawtimber was limited to three main species: ponderosa pine, Engelmann spruce, and Douglas-fir. The pine was the most important; Douglas-fir provided relatively insignificant amounts. According to early reports, all three species were scattered and, with few exceptions, were not reproducing. This was particularly true of the pine. A brush fire stripped the area of young growth and ground cover. Together with intensive grazing, this almost eliminated the conditions necessary for natural reproduction. Much of the Forest was mature and even-aged and stood in scattered growth over wide tracts (Peterson 1971).

In the 1920's, the gross area of the Manti NF was 810,034 acres. Only 13 percent (105,470 acres) was covered by coniferous forest. Engelmann spruce comprised 62 percent, subalpine fir 22 percent, Douglas-fir 8 percent, ponderosa pine 6 percent, and white fir 2 percent. Pine was confined to the extreme southeast slopes. The most accessible stands were cut over and only the best species were removed; overmature, decadent, unmerchantable stands of subalpine fir were left. Aspen was the largest cover type on the Forest and covered 25 percent of the gross area. It uniformly covered the entire Forest, but was also patchy. Pinyon-juniper comprised 10 percent (Peterson 1971).

Working Circle	Aspen	Timbered
	Acres	
Clear Creek	48,745	9,950
Mt. Pleasant	31,900	16,580
Huntington	47,900	36,760
Ephraim	5,500	2,360
Manti	27,500	13,520
Emery	32,700	26,300
Total	194,245	105,470

Grazing caused excessive erosion and permitted numerous floods in the Sanpete Valley, making watershed protection important. The coniferous timber occurred in small areas, usually at the heads of canyons on the north and east slopes. Fires "ran riot" prior to the establishment of the Forest; from then until the 1920's, not one "destructive fire" occurred (Forest Service 1924).

Wasatch-Cache-Uinta National Forest

Cache Valley—A study conducted by Hull and Hull (1974) described the vegetation in the Cache Valley and when changes in its composition occurred:

> In 1825 Ogden's Hudson Bay trapping party traversed the length of the valley, and repeatedly mentioned plains covered with huge herds of buffalo. An 1870 report to the U.S. Commissioner of Agriculture stated the Cache Valley was probably the finest grazing section in the entire Salt Lake basin and must become a favorite pasture ground for stock raisers. Notes from a public land survey in 1855-78 indicated good grass for grazing and sometimes for mowing on most areas. Sagebrush was rarely mentioned. Sagebrush in this area was rare when the 1876 land survey was made. However, grazing was very heavy and by 1888, sagebrush covered the foothills and much of the flats.
>
> After settlement, the local livestock and later migratory sheep used this area so heavily that the grass decreased and sagebrush increased. Within 40 years after settlement, sagebrush was abundant and the settlers could count the migrating bands of sheep by the clouds of dust. Northern Utah and southern Idaho were essentially a grassland with small amounts of sagebrush but uncontrolled livestock grazing had reduced the perennial grass and allowed sagebrush to increase.

Hull and Hull (1974) also provided a list of the native species present at the time of settlement:

Pseudoroegneria spicata	bluebunch wheatgrass
Elymus lanceolatus	streambank wheatgrass
Leymus cinereus	basin wildrye
Koeleria macrantha	junegrass
Poa secunda	Sandberg bluegrass
Pascopyrum smithii	western wheatgrass
Poa spp.	bluegrasses
Achnatherum hymenoides	Indian ryegrass
Hesperostipa comata	needle and thread
Sporobolus crytandrus	sand dropseed
Balsamorhiza sagittata	arrowleaf balsam-root
Heliathella uniflora	little sunflower
Lithospermum ruderale	stone seed
Linum lewisii	flax
Lupinus spp.	lupine
Balsamorhiza macrophylla	cleft-leaf balsam
Crepis spp.	hawksbeard
Achillea millefolium	yarrow
Penstemon spp.	penstemon
Purshia tridentata	bitterbrush
Chrysothamnus spp.	rabbitbrush
Prunus spp.	chokecherry
Amelanchier alnifolia	serviceberry
Rosa spp.	wild rose
Acer grandidentatum	bigtooth maple
Juniperus osteosperma	Utah juniper

Rich County (Cache Valley, UT) was settled in 1863 by the Mormon pioneers. According to the settlers, "the hills which are covered with fine grasses and promise well for grazing, the grass looked like a waving grain field" east of Bear Lake. Most early settlers made no effort to own range land because of the abundance of excellent free grazing (Anonymous n.d.b).

Emigration Canyon—An excerpt from Cottam and Evans (1945) gave a brief description of the conditions in Emigration Canyon when the Mormon pioneers arrived:

> William Clayton an early Mormon historian stated that it was necessary, because of the dense vegetation, for the pioneers to construct a road through Emigration Canyon. In July 1847, Erastus Snow and Orson Pratt traveled through Emigration Canyon in advance of the main pioneer party. Snow said that "the thicket down the narrows at the mouth of the canyon was so dense that we could not penetrate through it. I crawled for some distance on my hands and knees through this thicket until I was compelled to return." Clayton described the trek down Emigration Canyon as follows: "the grass on the creek grows from six to twelve feet high [Leymus condensatus]." At their last camp, a position six miles from the mouth of the canyon he wrote, "the grass here appears even thicker on the ground than where we left this morning. The grass is approximately four feet high and very thick."

The conclusion of G.D. Pickford (1932), who studied the influence of heavy grazing and burning on spring-fall ranges in Utah, and the unpublished observations of others, are that the foothill vegetation of the mountains on the eastern rim of the Great Basin at the time of white settlement was the grass type (Cottam and Evans 1945).

Mill Creek and Big Cottonwood Canyon—Albert Potter drafted a proposal in 1907 to create the Salt Lake Forest Reserve. In it was a description of Mill Creek and Big Cottonwood Canyon:

> The lower slopes of Mill Creek are covered with oak, maple and a variety of other brushes. The higher part of the slopes are covered with aspen, and on the north slopes and tops of the ridges with forests of spruce and fir. All of the forest areas have been cut over for lumber and railroad construction and merchantable timber at present is scarce.
>
> Big Cottonwood Canyon is well covered with brush on all sides six miles up the canyon. The patches of timber are also much thicker and on the north slopes come down close to the creek. Mill D Flat has tracts of spruce and fir along the south side of the canyon but has been cut heavily. On the north side of the canyon the slopes are covered with aspen and brushy thickets extending to the summit. Two bands of sheep were seen in this area and the country shows signs of heavy grazing. At Silver Springs a sawmill has been operating which has made a clean cutting on the southern slopes. Reproduction is coming in where the forest has been cut. It would be difficult to find a seedling big enough to make a club to kill a snake.
>
> Conifer species of the Wasatch Mountains include: Engelmann spruce, blue spruce, Douglas-fir, subalpine fir, white fir, limber pine, and ponderosa pine. The ponderosa pine is very scarce except in a few places in the southern part of the range. The basin of Big Cottonwood above Silver Lake is covered with scattered spruce and fir. The aspen commences near the mouths of the canyons and is found in patches all the way up the mountain. It sometimes forms forest almost exclusive of other species. The higher portion of the mountain is quite barren and has only a very scattering growth of conifers. Along the streams there is considerable maple, birch, cottonwood, oak, hawthorne, box elder, etc. The lower slopes of the mountain along the canyons are covered with scrubby oak and maple brush, and a variety of other small brushes. The proportionate distribution of the different classes of land is as follows:

	Percent
Pine, spruce, and fir	20
Aspen and brushy thickets	45
Sage brush	10
Rough mountain tops with only very scattered timber	25
	100

Green River Working Circle—In 1929, a management plan (Hasel 1929) was written for the Green River Working Circle that included that part of the Wyoming NF drained by the Green River, and the Smith's Fork, Black's Fork, and Bear River drainages of the Wasatch NF (table 3).

Table 3—Number of trees per acre by size class and cover type for the Wasatch National Forest (Green River Working Circle) in 1929.

Unit #	Lodgepole pine	Alpine fir	Engelmann spruce	Douglas-fir	Limber pine	All species
			D.b.h.			
4	18.00	13.00	2.00	0.01	1.01	34.02
5	15.00	8.00	1.00	0.01	0.87	24.88
6	16.40	5.20	0.61	0.01	0.91	23.13
7	24.84	10.44	1.47	0.01	0.98	37.74
8	19.36	6.88	1.13	0.01	0.91	28.29
9	21.70	4.98	1.93	0.01	0.86	29.48
10	19.33	4.25	0.71	0.02	0.82	25.13
Subtotal	134.63	52.75	8.85	0.08	6.36	202.67
11	14.00	2.95	0.81	0.05	1.25	19.11
12	13.81	2.45	0.76		0.64	17.66
13	9.80	1.10	0.44	0.02	0.64	12.00
14	8.21	1.13	0.44		0.28	10.06
15	5.11	0.88	0.50		0.17	5.71
16	4.32	0.56	0.66		0.08	2.16
17	1.65	0.24	0.14	0.05	0.06	2.67
18	1.80	0.27	0.44	0.10	0.02	0.82
19	0.51	0.12	0.12	0.05	0.01	0.70
20	0.21	0.12	0.36		0.01	0.57
21	0.32	0.10	0.12	0.02		0.53
22	0.22	0.10	0.19	0.02		0.14
23	0.05	0.07	0.02			0.14
24		0.02	0.12		0.01	0.15
25	0.05		0.07	0.02		0.09
26		0.02	0.07			0.04
27		0.02	0.02			0.02
28			0.02			
29						0.07
30			0.05	0.02		
31						0.02
32			0.02			
33						
34						
35						
36						
37						
38						
Subtotal	60.06	10.15	5.37	0.35	3.17	79.10
Total	194.69	62.90	14.22	0.43	9.53	281.77

Source: Hansel (1929).

The working circle vegetation was classified in the following types:

	Acres	Percent
Lodgepole pine	195,631	68
Engelmann spruce	51,785	18
Subalpine fir	20,138	7
Douglas-fir	5,754	2
Others	14,384	5
Total	287,692	100

The foothill country was covered with sagebrush; at 8,000 feet elevation there were patches of aspen.

Tables 4 and 5 show the number of acres and age classes by cover type for the working circle in 1926.

The following is a description of the timber present in the Green River Working Circle watersheds in the early 1900's.

Black's Fork

The merchantable timber on the watershed of the Bear River is chiefly lodgepole pine, but along the bottoms of the streams and at the heads Engelmann spruce predominates. The same is true of the stand on the Black Fork watershed, except that there is proportionately less Engelmann spruce in the mixture. There is a large amount of quaking aspen scattered along the streams. Lodgepole pine trees run from 8 to 14 inches dbh and are seldom over 18 inches dbh. Engelmann spruce is somewhat larger, running from 14 to 20 inches dbh and seldom over 30 inches. Aspen occurs in pure even-aged stands and is generally small in size, averaging about 8 to 10 inches dbh. (Warner 1906)

Smith's Fork (West Fork)

The forest consists almost of a pure even-aged stand of lodgepole pine with the exception of the forest found in the southern tier of sections (southern end of T 2 & 3 N, R 13 E), where at higher altitudes, the predominate tree is Engelmann spruce. Throughout the pine forests, the spruce is scattered and in small groups in the moister localities, with a few scattered subalpine fir mixed in with the pine.

The stand of pine is one of the best average stands of the species. The mature trees are about 60 feet in height, and range in diameter from 10 to 24 inches. The stand where fire has not run through is unusually dense, 300 to 400 trees to the acre. The large proportion of these trees are under 10 inches in diameter. The reproduction of pine in areas that have been burned is prolific, except where a second fire has destroyed the seedlings which sprang up after the first fire.

A considerable part of the area examined has been run over by fire. The fire which covered the largest area originated from the burning of a sawmill located near the southwest corner of Section 4, T2N, R13E in 1864. This fire spread to the south and covered an area of 2 or 3 sections and may have jumped to the east and ran up through the timber at the head of Gilbert Creek. In Section 2 of the same township, also in Section 11, from the absence of reproduction and the charred appearance of the down timber, it is evident that a second fire followed in the tracks of the first. (Redington and White 1906)

Bear River Block/Smiths Fork Comp/West Fork Sub-Comp

Had there been no fires in the past, the entire timber area would be merchantable lodgepole pine. As it is, 2426 acres are classed as burn and immature, and 5108 acres are classed as merchantable timber. The area north and east of Gilbert Meadows is of poor quality, mistletoe and fire injuries are common.

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Table 4—Number of acres by cover type for the Green River Working Circle, Wasatch National Forest 1926 (from Forest Service 1926a).

Sub. comp.	Lodgepole pine		Engelmann spruce									
	Productive	Non-productive	Productive	Non-productive	S.A.	Aspen	Barren	Grass	Sage	Brush	Water	Total
Black's Fork Compartment												
West Fork	6,468	1,400		1,525	3,025		5,016	5,891			10	23,435
East Fork	7,470			3,560	1,500		15,385	4,000			20	31,935
Total	14,038	1,400		5,085	4,525		20,401	9,891			30	55,370
Bear River Compartment												
West Fork	1,450	500	1,450	900	3,100	700	735	3,100	300			12,235
Hayden's Fk	5,040	1,900	1,260	500	2,000		4,700	1,080	800			17,280
Stillwater	8,308		626		2,322		9,604	214				21,074
East Fork	7,920	140	970		4,220	730	8,510	940				23,430
Mill Creek	5,629		24		478			1,476				7,607
Total	28,347	2,540	4,330	1,400	12,120	1,430	23,549	6,810	1,100			81,626
Smith's Fork Compartment												
West Fork	10,998	128	1,210	244	117	5	610	1,612		182	6	15,112
East Fork	13,098	6,378	598	2,101	534	182	4,304	2,389	129	786	537	31,036
Total	24,096	6,506	1,808	2,345	651	187	4,914	4,001	129	968	543	46,148
Green River Working Circle												
Grand total	66,481	10,446	6,138	8,830	17,296	1,617	48,864	20,702	1,229	986	573	183,144

South and west of Gilbert Meadows there is a large irregular area of excellent timber and the character of old snags in the burned parts indicates that most of the region now restocking will make heavy stands of merchantable timber when the young trees have grown. The large irregular burned areas are restocking in every case noticed. (Forest Service 1915a)

Provo River Working Circle—In 1926, a management plan was written for the Provo River Working Circle headwaters of Weber and Provo Rivers, and a small area on the North Fork of the Duchesne River (includes T. 1-6 S., R. 5-9 E.) (Forest Service 1926b). The following are some statistics from this plan:

	Acres	Percent of total
Lodgepole pine	37,397	55
Engelmann spruce	20,492	29
Douglas-fir	7,771	11
Fir	3,529	5
Total	69,189	100

Most of the merchantable lodgepole is overmature and decadent; much of it is dead.

Age Class	Acres	Percent of total
Reproduction (0-40 years)	8,137	12
Poles (40-80 years)	3,394	5
Intermediate (80-120 years)	2,240	3
Mature (120-160 years)	19,462	28
Overmature (160+)	35,956	52

In 1936-37, surveys were completed in subcompartments 15 to 26 miles east of Kamas and 60 to 71 miles southeast of Salt Lake City. Iron Mine and Spring Canyon subcompartments are bench areas located on the east and

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Overmature (160+)	35,956	52

In 1936-37, surveys were completed in subcompartments 15 to 26 miles east of Kamas and 60 to 71 miles southeast of Salt Lake City. Iron Mine and Spring Canyon subcompartments are bench areas located on the east and

Table 5—Age class for productive types by acres for the Green River Working Circle, Wasatch National Forest 1926 (from Forest Service 1926a).

	Lodgepole pine							Engelmann spruce					
Sub. comp.	**OM**	**M**	**T**	**IM**	**REP**	**CUT**	**Total**	**OM**	**M**	**T**	**IM**	**REP**	**CUT**
Bear River Compartment													
West Fork	375	375	50	500	100	200	1,600	375	375	50	300	100	100
Hayden's Fork	1,200	1,200	720	1,920			5,040	600		180	480		
Stillwater		3,338		4,970			8,308		626				
East Fork		1,739	890	1,760		3,531	7,920		820		65		85
Mill Creek				1,335		4,294	5,629		24				
Total	1,575	6,652	1,660	10,485	100	8,025	28,497	975	1,845	230	845	100	185
Black's Fork Compartment													
West Fork		2,169			130	4,269	6,568						
East Fork		1,408		85	595	5,382	7,470						
Total		3,577		85	725	9,651	14,038						
Smith's Fork Compartment													
West Fork		6,410	181	199	4,208		10,998		1,103		107		
East Fork	405	6,743	256	4,293	1,401		13,098		576		22		
Total	405	13,153	437	4,492	5,609		24,096		1,679		129		
Green River Working Circle													
Grand total	1,980	23,382	2,097	15,062	6,434	17,676	66,631	975	3,524	230	974	100	185

west side of the Provo River between Trial Lake and Soapstone Guard Station. The Duchesne subcompartment borders the east boundary of the Iron Mine subcompartment (Cox and Taggart 1938).

> Lodgepole pine comprises 99.6% of 11,808 acres of the productive type. Associate species are Engelmann spruce and subalpine fir with a scattered mix of aspen. Douglas-fir is present in small quantities. There is an abundance of lodgepole pine and spruce reproduction over most of the area. Lodgepole constitutes 90% of the stand.
>
> The Engelmann spruce type is scattered and occurs only near lakes or meadows. Most stands average about 80% pure. Reproduction is well represented over most of the subcompartments. Spruce stands comprise .4% of the 11,808 acres of the productive type.
>
> Aspen is confined to the north slope of the Iron Mountain subcompartment and on the south slope of the southwest portion of the Spring Canyon subcompartment. Principally pure stands of young growth (under 6 inches dbh) comprises 12% of the 9,316 acres of nonproductive type.
>
> Grass consists of meadows over 2.5 acres in size. This cover type is 316 acres or 3% of the 9,316 acres of nonproductive area.

Wasatch Front—In 1865 Orson Hyde, a Mormon church leader, said "the range is becoming more and more destitute of grass; the grass is not only eaten by the great amount of stock that feed on it, but they tramp it out by the very roots. Where grass once grew luxuriantly, there is now nothing but desert weed, and hardly a spear of grass is to be seen" (Forest Service 1972).

Daniel Gull, a sheepman at the turn of the century, painted a gloomy picture of grazing conditions on the Forest (Forest Service 1972).

> During those years, all of this country was overstocked with sheep and the range was badly abused. All grass and seeds would be consumed and the brush and chokecherry bushes would be browsed as high as sheep could reach by the 24th of July. The flats would become dust beds, sometimes six inches deep. After that we would take the sheep back into lower country and hold them on oakbrush points and sagebrush, trailing them around from place to place wherever we could get a few days feed. In spring there would be a scant growth of grass and weeds, the palatable brush species, except oak, were heavily grazed, thinned out and killed. Snowberry and elderberry had almost disappeared from the range just prior to the time the country went into the Forest Reserve. There was very little underbrush and low vegetation to stop run-off, from Wallsburg Ridge around to Soldier Summit. There was lots of soil washed away and deep washes were started.

The job of the early Forest Ranger was not easy. Grazing was a free-for-all in the mountains. Cattle and sheepmen would race to get the strategic water holes. In 1902 Albert Potter found there was a great deal of abuse to the land in the Wasatch Range, especially in the northern and central areas. Potter saw a band of sheep on the head of Potter Canyon "which were quite thin in flesh and seemed to be living on fresh air and mountain scenery." Potter also wrote about what he found in American Fork Canyon. It was "overstocked and badly tramped out in some places" (Forest Service 1972). Near Mud Lake he found:

> All of the timber cut out and this section has been heavily grazed by sheep and some damage done by tramping. Wadsworth and Packard Canyons were damaged by sheep grazing. The ridge south of Hall's Canyon was cut out by loggers and since burned over until at present there is not very much left. All of this country has been overgrazed by sheep. Wanrhodes Basin was also very heavily grazed-the cattle are living entirely upon oak leaves. (Forest Service 1972)

At Sheep Creek, he found the country stocked with cattle subsisting principally on oakbrush (Holmes 1990).

In the first year of Forest Service supervision in 1906, approximately 60,000 sheep lambed on the watersheds of Soldier Fork, Diamond Fork, and Hobble Creek; 40,000 summered on this area. Ranger W. Jones Bowen of Spanish Fork RD, documented that practically all of the drainage to Utah Valley had been overgrazed. Prior to the creation of the Forest, large numbers of sheep grazed these areas too early in the spring, before plants were ready for grazing, and late in the fall after the feed had dried up. No thought was given to any kind of range management. The one thought of sheepmen using this area was to get the feed, regardless of the damage done to the range (Holmes 1990).

During the 1870's and 80's, the development of mines and the building of new railroad spur lines contributed to a great deal of logging in the forest. Since no government control on logging existed, whole areas were completely cut down, sometimes burned, and never replanted. Ample supplies of wood for fuel as well as for building homes, barns, fences, and implements were obtained from canyons of the Wasatch Front. Along the Spanish Fork River bottom Parley Pratt wrote:

> Cottonwood timber and willows abounded, and greasewood and sage were plentiful all along the prairie....The company passed low swamp land for ¾ of a mile and also noticed rich black soil....They found plenty of dry feed and the soil dry and sandy with sage and greasewood abundant, and the mountains covered with cedar and fir. (Holmes 1990)

Millers originally settled the Springville area in 1850. The logs were removed from the forks of Hobble Creek Canyon. The first road into Spanish Fork Canyon was built to gain access to poles. In 1859, 30 men retrieved a pole 105 feet in length to be used as a liberty pole for the Fourth of July celebration. An area up the left fork of Hobble Creek Canyon was named Pole Heaven (or Haven) for the large quantity of tall, straight trees. With as many as 25 different crews concurrently logging in the area, it was soon depleted.

In the 1860's wood demand increased when a nationwide telegraph line was installed. Timber for telegraph poles was also used for a Mormon telegraph connecting settlements from north to south. During the 1870's and 80's mining and railroad building added to the demand. Large areas were clearcut and sometimes burned. The combination of human-caused and naturally-occurring fires resulted in widespread coverage by fire (Holmes 1990).

In 1869, the U.S. Government printed a series of books describing various aspects of the environment (including geology, and zoology) found in the Great Basin. These volumes were the result of a geological exploration of the 40th parallel made by the Engineering Department of the U.S. Army headed by Clarence King. The botany volume was dedicated to the description of the vegetation. The following is a brief description of the Wasatch Front.

> The steep slopes of the Wahsatch which face the western valley are bare of trees and dry, only partially covered toward the base with scattered thickets of a low form of *Quercus alba* [*Quercus gambelii*]. In the canons there is a free growth of shrubs such as *Cowania* and *Celtis*, *Cercocarpus parvifolius*, *Acer glabrum*, *Spirea*

opulifolia, Rosa fraxinifolia, Pachystima, and near the streambanks *Rhus aromatica* and *glabra*, *Acer grandidentatum, negundo*, *Sambucus racemosa*, and *Betula occidentalis*. The timber consists of *Pinus flexilis*, and ponderosa and the smaller contorta, with *Abies menziesii, engelmannii* and *douglasii, grandis* and *amablis*. In some of the canons the cottonwood attains a large size, but the oak, which is frequent through the Wahsatch, and maple are rarely large enough to become of value. The valleys of Bear River and the Weber have a flora resembling that of the higher valleys of the Basin, with Artemisia, but in the still higher parks the vegetation is principally herbaceous. (Watson 1871)

In addition to the narrative, Watson also included a complete listing of all plant species he encountered during the expedition. The list is located in Appendix A.

In 1911, Ranger W. Jones Bowen reported that very few fires occurred. Little attention was given to fire prevention and suppression in the early days of the Forest Service. Most of the small patches of timber that grew in the canyons of the Utah Valley drainage had been cut over and logged several years prior to the creation of the Uinta Forest. When it was created, there was almost no commercial timber left on any lands in the Utah Valley drainage.

Utes occasionally set fires in Utah Valley to clear underbrush, drive out game, or roast insects. Eli Day of Mt. Pleasant wrote in his diary "In those days we had many forest fires in and over the Wasatch Mountains. When hearding [sic] along the river on father's land, we would watch the smoke roll up from these fires, sometimes like billows, other times like mounting clouds..." (Holmes 1990).

Uinta National Forest—The Dominguez-Escalante expedition of 1776 covered portions of the Uinta Basin through the area around Strawberry Reservoir west into the Utah Valley and south toward Sevier Lake and Toquerville (Warner 1976). Excerpts from their journal follow:

On September 21, 1776 we set out from the top of El Ojo de Santa Lucia [Deep Creek drainage, one mile from Summit alongside US 40], toward the southwest along the narrow valley which ascended through a grove of white poplar [aspen]. After going a quarter league we swung west for a league and three-quarters, over bothersome sagebrush stretches, through low narrow valleys of very soft dirt and many small holes in which, because they lay hidden in the undergrowth, the mounts kept sinking and stumbling at every instant [area around Strawberry Reservoir].

This river [Trout Creek, now buried under the NE bay of Strawberry Res] runs to the southeast along a very pleasant valley with good pasturages, many springs, and beautiful groves of not very tall or thick white poplars ...after going one league south-southwest through a narrow valley with a lot of sagebrush and bad surface, and at the end of three-quarters [Bryant's Fork]. We continued west another quarter league and entered a dense forest of white poplar, scrub oak, chokecherry, and spruce; then, through the same forest we took the southern slope of a forested narrow valley, and after going a league west by south crossed over to the other side. The guide was hurrying so fast that he vanished in the forest at every step, and we knew not where to follow him because, what with the great density of the forest, there neither was a foot path nor could his track be discerned in many places. We continued through the forest, which became denser the more we advanced, and after going west for a half a league we emerged from it, arriving at a very lofty ridge [Strawberry Ridge]. Along this ridge we went southwest for a quarter league and descended it, breaking through almost impenetrable swaths of chokecherry and

> scruboak and passing through another poplar forest so thick that we doubted if the packs could get through unless they were first taken off. In this dense growth, Padre Fray Francisco Atanasio got a hard blow on one knee against a poplar tree. We finally descended with great difficulty and labor into a deep and narrow valley [Sixth Water Creek drainage] in which, on finding enough of the pasturage which abounds throughout all this sierra, and water for ourselves and for the animal herd, we halted in it after having traveled a league west in the descent.

Fire History—Wadleigh and Jenkins (1996) conducted a fire history study in the T.W. Daniel Experimental Forest, adjacent to the Wasatch Cache NF, approximately 25 miles east of Logan, Utah. The objective of the study was to determine if the existing vegetative mosaic was correlated with the fire history of the study area. Has fire frequency changed between presettlement, settlement, and suppression eras? Additionally, if fire frequency has changed, is that change reflected in the vegetative structure visible today?

There are three forest cover types (lodgepole pine, Engelmann spruce/subalpine fir, and quaking aspen). Of the 15 delineated stand types, subalpine fir was a major secondary stand component in nine types and the principal component in two. Regeneration surveys conducted at each plot showed subalpine fir to be the primary regeneration component in 13 of the 15 types (Wadleigh and Jenkins 1996).

Sixteen fire years were represented in scar and/or regeneration data. Only one fire year (1903) was common to all three forest types. The mean fire interval for the entire area (approximately 400 acres) was 18 years. Mean fire return intervals for presettlement, settlement and suppression eras are summarized:

Cover type	Presettlement (1700-1855)	Settlement (1856-1909)	Suppression (1910-1988)	Total (289 years)
Study area	39 (1-122)	5 (1-30)	79	18
ES/AF	—	9 (1-30)	79	41
LP	39 (12-122)	6 (1-17)	—	22
AS	156	13 (4-16)	—	58

The lack of disturbance by fire in the last 80 years has allowed succession to proceed toward a climax of subalpine fir. The increase in fire frequency following settlement was probably due to efforts to exploit natural resources and a concomitant increase in ignition sources. Frequent disturbance by fires during the settlement period resulted in the present mature vegetative mosaic. These earlier frequent fires favored lodgepole pine, and the less frequent fires of the suppression period favored more tolerant species, as indicated by the presence of subalpine fir regeneration in all cover types (Wadleigh and Jenkins 1996).

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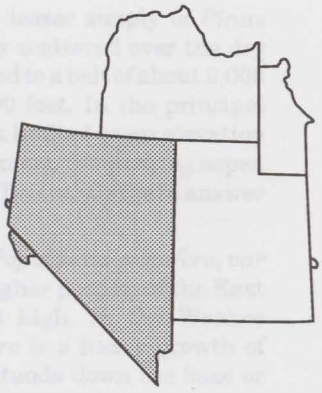
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Nevada Forests

Early Botanical Descriptions

During the early 1840's, J. C. Fremont explored the interior of the Great Basin and found a succession of sharp mountain ranges and "naked plains."

> These ranges are isolated, presenting summit lines broken into many peaks. They are thinly wooded with some varieties of pine (*Pinus monophylla*), cedar, aspen, and a few other trees; they afford an excellent quality of bunchgrass, equal to any found in the Rocky Mountains. Black-tailed deer and mountain sheep are frequent in these mountains; which, in consideration of their grass, water, and wood, as signifying a capacity to produce, or bear, and in contradiction to sterility. In this sense these interior mountains may be called fertile. Sterility, on the contrary, is the absolute characteristic of the valleys between the mountains-no wood, water, or grass. The gloomy artemisia is the prevailing shrub. (Fremont 1964)

Beckwith, in 1854, reported an abundance of nutritious grasses in the hills above the California Trail along the lower Humboldt River that supported the horses of his Army detachment. This grass was also shared by the bands of livestock being driven to California (Billings 1994).

Watson (1871) listed the principal bunchgrasses in the sagebrush ecosystem:

Festuca idahoensis	*Poa secunda*
Poa secunda	*Festuca kingii*
Pseudoroegneria spicata	*Leymus cinereus*
Elymus elymoides	*Achnatherum occidentalis*
Hesperostipa comata	*Stipa occidentalis*

Before settlement, over 38 percent of the land area between latitudes 38° and 41° north and longitudes 117° and 120° west was sagebrush (*Artemisia tridentata, Purshia tridentata, Ephedra viridis*) and bunchgrass steppe forming a vegetational zone above the cold desert in elevation (Billings 1994).

The sagebrush-bunchgrass ecosystem, together with pinyon-juniper woodlands (*Pinus monophylla* and *Juniperus osteosperma*) would have occupied about 50 percent of the land in the western Great Basin 200 years ago. At that time, fires were rare in these ecosystems and there was little dry herbaceous vegetation to carry fire any distance (Billings 1994).

Lt. G. K. Warren (1855) found grass in abundance on nearly every range, but timber was scarce. Only scattered growth of cedar was seen on a few ranges. East of the Humboldt Mountains, growth of cedars and grass was more abundant. The valleys were "merely sprinkled by several varieties of sombre artemisia (wild sage), presenting the aspect of a dreary waste; though

there are spots more thickly covered with this vegetation." The soil was half covered with sagebrush for acres (Warren 1855).

In 1859, Captain J.H. Simpson led a group of U.S. Army engineers through the Great Basin in search of a direct wagon route from Camp Floyd (Utah) to Genoa in the Carson Valley. His notes provide a brief description of the vegetation they encountered.

> Dwarf cedar is seen on almost everyone of the mountain ridges, and high up in the mountains is not infrequently intermingled with the pine, pinon, balsam [*Abies bifolia*], quaking ash [aspen], and mountain mahogany.
>
> The most abundant plant in the Great Basin is the artemisia. It is seen almost everywhere in the valleys and on the mountains, it gives its peculiar bronze color to the general face of nature. This all-prevailing color is modified by the more vivid green of *Sarcobatus vermicularis* or greasewood; sometimes by the yellowish light-green of the Lynogris [genus Chrysothamnus], or rabbitbrush, both of which are found interspersed among the artemisia and on the mountains, not infrequently by the dark color of the scrub cedar, and occasionally of the pine and balsam. Sage covers 90% of the whole country intervening the east base of the Rocky Mountains and the east base of the Sierra Nevada. In height it is ordinarily about 2.5 feet though it was seen as high as 8 feet. Near the ground its trunk usually ranges in diameter from 3 to 6 inches, when very luxuriant nearly 1 foot.
>
> Greasewood is the next abundant plant and like the sage, is found between the Rocky Mountains and Sierra Nevadas. It is sometimes found alone but more frequently scattered among sagebrush. Its height ranges from 3 to 4 feet. A third plant which is about as abundant as the greasewood and grows with it and sagebrush is rabbitbrush. It is usually 2.5 to 5 feet tall. Another common plant, which does not have as much coverage in the western portion of the Great Basin is *Ephedra peduculata* [likely *E. viridis* or *E. Nevadensis*].
>
> A fourth plant or tree which was never seen anywhere else than in the mountains of the Great Basin is what the Mormons call mountain mahogany. It is found scattered in groves usually near the summit of the mountain passes. At a distance it looks like an apple tree-its leaf resembling somewhat that of the live oak. It is somewhat scrubby in appearance and attains a height of 15-20 feet and a diameter across its branches in the tree of 15-20 feet. It is not seen in considerable quantities.
>
> The canons of Se-day-e Mountain [area near Gibralter Creek] abound in pure water and splendid grass. Cedar and pines are also found, as they have been in nearly every range since we left the Great Salt Lake Desert. These cedars branch immediately from the ground, are 12 or 15 feet high and present in the mass a rotund form. The pines are generally on the summits of the ridges, and are generally not more than 25 or 30 feet, though some attain a height of 50 feet. (Simpson 1876)

Watson (1871), in his vegetative descriptions of the 40th parallel, summarized what he found in Nevada. He commented on the vast amount of sagebrush present in the valleys and on the hillsides.

> The everlasting sagebrush (*Artemisia tridentata*) is by far the most prevalent of all species, covering valleys and foothills in broad stretches farther than the eye can reach. The growth never so dense as to seriously obstruct the way, but very uniform over large surfaces, very rarely reaching the saddle-height of a mule and ordinarily but half that altitude. On the foothills only and not ascending above the base of the mountains *Purshia tridentata* is widely distributed, and of frequent occurrence with it in western Nevada are *Ribes leptanthum* and *Prunus andersonii*. *Ephedra antisyphilitica* [likely *E. viridis*] is also abundant westward and especially southward.
>
> The mountains are in a large measure as destitute of trees as the valleys, or even more naked from the dwarfed character of the shrubs upon the exposed ridges and summits. There is generally, however, upon limited portions of all but the lowest

ranges from the Sierras to the Wahsatch a greater or lesser supply of *Pinus monophylla* or *Juniperus occidentalis*. These are usually scattered over the dry slopes, rarely exceeding 10 or 15 feet in height, and confined to a belt of about 2,000 feet in width between the elevations of 5,000 and 7,000 feet. In the principal ranges, the mountain mahogany is freqently present but limited to an elevation of 6,000 to 8,000 feet. On the stream banks in the upper canons, the quaking aspen is usually found, mostly small, but sometimes growing sufficiently large to answer for telegraph poles.

In the Shoshone Mountains, the willow-leaved poplar (*Populus balsamifera, var angustifolia*) occurs abundantly in some canons of the higher portion of the East Humboldt Range, becoming a handsome tree 60 feet high. In the Washoe Mountains in common with the rest of the Sierras there is a heavy growth of several species of conifers, of which *Pinus ponderosa* extends down the base or even on to the valley slopes. A few scattered trees of the same species were also seen on the northern part of the Virginia Mountains. In the southern Toyabe Mountains some pines and firs are found, probably the same species as those of the East Humboldt Range. Here *Pinus flexilis* was met with in considerable numbers in the canons, ranging from near the base to the higher divides and slopes, where also were a few specimens of *Pinus longaeva* [Bristlecone pine], while in some of the high western canons there is a dense growth of *Picea engelmannii*. In no case do these species cover more than very limited portions of the mountains, and probably never exceeding 40 or 50 feet in height.

In the presence of moisture and especially upon the sides of the higher canyons, there is frequently a considerable amount of shrubby or perennial herbaceous growth. The most common species are *Ceanothus velutinus*, forming dense and tangled patches at an altitude of from 7,000 to 9,000 feet, *Ribes cereum* scattered over all the mountain sides from base to summit, *Amelanchier alnifolia* and *Symphoricarpos oreophilus* of equally wide range but in rather moister localities, and also *Prunus virginiana*, but confined to the neighborhood of streams.

The mountain flora shows a larger number of shrubby species than that of the valleys, though many of them are very sparingly distributed. Among the herbaceous species there is a marked predominance of certain orders, genera, or sections of genera, mostly perennials, especially of Penstemon, Eriogonum, Lupinus, and Castilleja.

Watson made a complete list of all plant species he encountered. The listing of plants he identified on or near future National Forest lands is in Appendix A.

Charles S. Sargent (1879) reported on the forests of central Nevada as part of a report to study *in situ* the trees of the Great Basin, and to introduce into cultivation some of the peculiar plants of the region. This study took him to the great mining center of Eureka, through Dry and Fish Spring Valleys, and the Monitor Range.

Aspen borders all the mountain streams above 8,000 feet elevation, but rarely surpassing 15 feet in height and a few inches in diameter. Further east in the Wahsatch Mountains this species is sometimes seen with stems two feet through. *Juniperus osteosperma* is the most common, and the most widely distributed of the trees of this region. It is found at lower elevations than any other tree, and alone it is often abundant, but less so than on the mountains sides, over which it spreads up to 8,000 feet elevation.

Growing with this juniper, above 6,000 feet elevation, and extending rather high up in the mountains, is *Pinus monophylla*. It is a small tree, 10 to 20 feet high, with reddish scaly bark, and highly prized for making charcoal than that of any tree of this region. *Pinus balfouriana* was only met with on Prospect Mountain, near Eureka, at an elevation of 7,500 feet, to the summit, 8,000 feet. Formerly the whole summit of this mountain was generally covered with this species, but with few exceptions the trees have all been cut to supply the mines with timbering, for which purpose the strong and very close-grained, tough wood of this species is preferred to that of any other Nevada tree. The specimens seen were 15 to 30 feet high, with trunks often two feet in diameter.

Pinus flexilis is the largest and the most valuable timber tree of the central portion of the Great Basin. I found large tracts of it on the Monitor Range, from 8,000 feet up to 10,000 feet elevation; and further to the northeast it gives their names to White Pine District, White Pine Range, etc. On the Monitor Range specimens 50 to 60 feet high, and from two to four feet in diameter were not infrequent, the trees gradually becoming smaller as the elevation increased, until at 10,000 feet they were little more than prostrate bushes a foot or two high.

Cercocarpus ledifolius attains its largest size and greatest age. It is common at 6,000 to 8,000 feet, and next to the juniper and nut pine is the most common of central Nevada trees. It is a small tree 10 to 30 feet high, with small evergreen leaves and brown scaly bark. The largest specimen of this tree was seen on Prospect Mountain near Eureka, in New York Canon, at an elevation of 7,000 feet. It was a low, much branched tree, about 20 feet high with a trunk rising 6 feet to the first branches. At 3 feet from the ground it had a girth of 7 feet and 5 inches.

Capt. George M. Wheeler (1889) and the U.S. Army Corps of Engineers surveyed the lands west of the 100th meridian, which included the interior of Nevada. He found pines growing near the summit of the Humboldt Range and southward towards Hastings Pass. Mountain mahogany (*Cercocarpus ledifolius*) reached nearly the same altitude as spruces and aspen, and cottonwoods 1 to 2 feet in diameter marked the streams of several gulches. No trees were noticed in or near Maggie Creek and Independence Valleys. Mountain mahogany was observed in many localities along mountain sides in Central Nevada. The summit of the Toquima Range "enjoys patches of pines, while juniper and pinon (*Pinus edulis*) are noticed at lower levels, as is the case for most of the ranges in central and southern Nevada."

In 1891, C. Hart Merriam, M.D. took notes while traveling on horseback across the deserts and desert ranges of the southern part of the Great Basin. A list of the plant species he found on or near future National Forest lands in Nevada is located in Appendix B.

In 1902, P.B. Kennedy collected information from a 55-mile transect across the Tuscarora Mountains in Elko County. He noted perennial grasses and some range deterioration, but no fire scars and no *Bromus tectorum* (Kennedy 1903). The same area was remeasured 50 years later and included five principal changes to the rangeland (Billings 1994):

1) Desirable shrub livestock browse had decreased.
2) *Agropyron spicatum* described as abundant by Kennedy had decreased to generally absent or less than 5% density.
3) Annuals had increased to an extreme degree much of this was *Bromus tectorum*.
4) Burn scars absent in 1902, now covered most of the transect and cheatgrass was present everywhere.
5) The stream channels had eroded deeper and wider.

Historically, the herbaceous stratum in the sagebrush-bitterbrush ecosystem was occupied by widely scattered bunchgrasses, and there was little fuel to carry fire through the community (Billings 1994). This view is not widely held according to Gruell (1996). Evidence suggests that fire was virtually eliminated following the introduction of livestock. Decades of extreme livestock grazing removed much of the perennial grasses. Cheatgrass invaded this overgrazed ecosystem easily and filled an open environmental niche; available soil moisture and low temperatures favorable to this winter annual accelerated its takeover (Billings 1994). By the 1930's, large range fires were common. Fires accelerated during the 1940's resulting in large areas burned in western Nevada.

The pristine environment available for exploitation by grazing consisted of a series of sagebrush/perennial bunchgrass communities. The species of sagebrush that formed the overstories in these communities were not preferred by cattle as browse and if eaten in quantity would cause the death of the browsing animals by disrupting the delicate symbiotic relationship with their rumen microflora (Young and Sparks 1985).

In contrast to the Great Plains where large herds of bison, pronghorn, and often deer and elk were displaced by the introduction of cattle, the sagebrush ranges of the Great Basin had few large herbivores. Most importantly, the herbaceous vegetation that composed the forage resource of the sagebrush grasslands was not preconditioned for heavy utilization by large herbivores (Young and Sparks 1985).

In early summer, 1850, a party of Mormons arriving in Carson Valley too early to cross the Sierras, founded Mormon Station (later Genoa) that fall they sold beef to hungry emigrants. In 1858 Dorsey, Notlinger, and Drexel brought 1,500 head to Carson Valley and Truckee Meadows from California (Hazeltine and others 1961). By 1859, the opening of the Comstock mines in Virginia City created a stronger demand for beef. Soon cattle were coming in from surrounding territories for sale at high prices to the Comstock miners.

Mormon interests were also increasing the livestock numbers in eastern Nevada. From 1859 to 1861, the Mormons entered Meadow Valley in Lincoln County and established settlements at Panaca and on the Mudd River. At the same time, cattle from California were first wintered on the range along the Humboldt River and along Pyramid Lake in western Nevada. During the drought of 1864 in California, many herds were driven into Nevada. Since western Nevada was already occupied, many of the newcomers headed east, invading Churchill County, portions of the Humboldt Valley, Reese River, and the Big Smoky Valleys in central Nevada (Hazeltine and others 1961).

Mining discoveries at Austin, Pahranagat Valley, sites throughout White Pine County, Eureka, and Pioche increased the demand for livestock. Within a few years most of the range in that portion of the Nevada was completely stocked (Hazeltine and others 1961). Nevada's cattle industry had begun in earnest upon the arrival of thousands of longhorns trailed up from Texas in 1869.

Conditions were favorable for the State's early cattlemen (Hazeltine and others 1961). Rich native grass and natural springs were plentiful. The northern and eastern portions were the most suited for grazing purposes. This was confirmed by the fact that over 50 percent of the cattle were found in Elko, Humboldt, and Washoe counties (Hazeltine and others 1961).

Another California drought in 1870 forced large numbers of sheep and cattle into Nevada. During that and the following year, the pastures and ranges of the entire State were fully utilized with 101,000 head of cattle and 53,000 head of sheep. In 1874 the ranges were overcrowded and many sections were deteriorating; there were 182,000 cattle and 70,000 sheep. Stock continued to increase until several severe droughts and the extreme winter of 1879-80 caused the cattlemen to move the surviving stock outside the State. This reduced the cattle number down to about 160,000 from the 1879 peak of 225,000 (Hazeltine and others 1961).

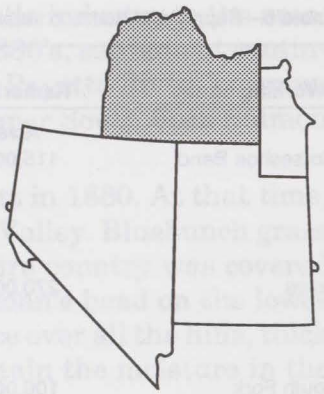
Timber Harvest

The forests of the Great Basin were a vital source of wood products for the mining industry from the 1860's to the 1920's (Young and Budy 1979). The pinyon-juniper woodlands were cut for the production of charcoal, firewood, fencing, and for other ranching and mining uses. During the 1870's, deforestation of pinyon-juniper was severe. By 1874, the slopes around the Eureka mills were denuded for a radius of 20 miles; 4,000 to 5,000 acres of woodland were cut annually to supply the mills (Young and Budy 1979). A typical yield of pinyon wood was 10 cords/acre and a cord made about 30 bushels of charcoal. At capacity, the furnaces of Eureka consumed over 530 cords of pinyon (50 acres) daily (Paher 1981). Eureka is not an isolated example of the heavy dependence on the woodlands. The spread of mining brought prospectors to nearly every mountain range in Nevada.

By 1873, Comstock's demand for lumber had depleted the east slope forests, and giant ponderosas and sugar pines of the Tahoe Basin were extensively cut. By 1895 the timber was gone, as was most of Comstock's rich ore. An estimated 50,000 acres had been logged, producing some 750 million bdft of lumber and a half million cords of wood (Paher 1981).

Despite the huge demand for charcoal in mills, the use of pinyon and juniper wood for home heating and cooking may have had an even greater effect on the amount cut (Young and Budy 1979). Every isolated mine and ranch had to have wood as a source of fuel and fencing. The corrals, for example, at the Walti Hot Springs Ranch in central Nevada, are constructed of 3,000 juniper poles. The dirt roofs of the native stone buildings are supported by pinyon-juniper trunks. Fifty miles of barbed-wire fence is supported by juniper posts, at 260 posts per mile. The woodlands above the ranch are laced with wagon roads among the stumps left from past use. One may multiply this example by the hundreds of ranches/mining prospects to estimate the impact of the use of the pinyon-juniper woodlands.

The historical significance of past extensive use is found in the present vegetation. The current pinyon-juniper woodlands are a product of human activities during the late 19th and early 20th centuries. The extensive wood products industry is gone, so the conifer woodlands of the Great Basin that have been in the formative stages of stand renewal for the past 70 years will, when they mature, be different from what we now know as the pinyon-juniper woodland (Young and Budy 1979).



Idaho Forests

Boise National Forest

As the Central Pacific Railroad built eastward from Sacramento between 1862 and 1869, travel and freighting by pack train and wagons developed from various points along the unfinished route into Idaho and the mines of South Boise and the Boise Basin. The discovery of gold at Thunder Mountain in 1893 resulted in the building of the Thunder Mountain road from the Boise Basin in 1902-03 (Smith 1983). In 1914, the Boise-Payette Lumber Company started building the Intermountain Railway up Grimes Creek to log the Boise Basin. The Railway gradually added more track up creeks where the grade was feasible, among them Grimes Creek, through Centerville to Pioneerville and Placerville, and these tributaries: Pine Creek, Wild Horse Creek, Wild Goat Creek, Meadow Creek, Granite Creek and its tributary Clear Creek, Town Creek, Lewis Creek, Smith Creek, and Sugar Creek. The Railway also built up Mores Creek to the foot of Mores Creek Summit and up the tributaries of Thorn Creek, Greenland Gulch, Baird's Gulch, Pine Creek, Bannock Creek, Granite Creek, Hoodoo Creek, and Boulder Creek (Smith 1983).

Timber Harvest—A water-powered sawmill was built on Grimes Creek in the winter of 1862-63. A steam-operated mill built by two men named Taylor opened in Idaho City, July 1863. Lafayette Cartee operated a sawmill at Rocky Bar in the summer of 1863. A sawmill was operated in the 1860's on Bear Run above Idaho City. Between 1862 and 1890, more than 20 sawmills operated in the Boise Basin (Smith 1983). In 1873, equipment for a sawmill arrived at Atlanta. Between 1890 and 1905, timber cutting occurred in the most accessible areas as mills were frequently set up on or near the logging sites. A mill was established in Cascade in 1914. Early timber harvesting in that area was done by horse skidding in conjunction with railroad hauling; railroad spurs were constructed up most of the major stream bottoms. One of the early large timber sales took place in 1923, when the Dion Lumber Co. bought 48,000,000 bd ft on Beaver and Pearsol Creeks (Smith 1983). Most was ponderosa pine, the rest consisted of larch, Douglas-fir, white fir, grand fir (*Abies grandis*), and Engelmann spruce. Tables 6 and 7 depict stand conditions on the Forest during the 1920's.

Grazing—When Douglas Knox first settled in the Emmett Valley, there was no sagebrush on the bench or the hills nearby. In the early and mid-summer, the country would be covered with a dense stand of grass 12 to 18 inches high and resembled a wheat field. It was probably one of the many brome grasses native to this area (Smith 1983).

Table 6—Supply and demand summary for the Boise National Forest in 1924 (from Mains 1924).

Working circle	Timberland	Age classes, species, and character of stand	Estimated annual growth M.B.F.	Character of present cuttings principal products
	Acres			
Horseshoe Bend	115,000	Yellow pine 35%, Douglas-fir 40%, lodgepole pine 14%, Alpine fir 8%. All age classes. Considerable mature and immature.	9,403	Logs and firewood for local use, and road building. Part of large sawmill chance on Payette NF.
Boise	270,000	Yellow pine 41%, Douglas-fir 38%, lodgepole pine 11%, alpine fir 8%. All age classes.	30,655	Small local demand, chance for large sawtimber and railroad tie sales.
South Fork of Boise River	100,000	Yellow pine 66%, Douglas-fir 24%, lodgepole pine 2%, alpine fir 7%. All age classes.	11,357	Small local use, chance for small mill, also for large sawtimber sales. Includes Sawtooth timber.
Total	485,000		51,415	
Payette NF portion Horseshoe Bend	62,800		8,792	Sawtimber for general markets.
Sawtooth NF portion S. Fork Boise River	250,000	All age classes yellow pine and Douglas-fir. Considerable mature.	3,500	Sawtimber for general markets.

Table 7—Stand table showing number of trees per acre based on 80 acres for Sec. 31, T. 19 N., R. 3 E., and Sec. 36, T. 19 N., R. 2 E., for the Boise National Forest in 1926 (from Koziol 1926).

Diameter	Ponderosa pine	Douglas-fir	Engelmann spruce	White fir	Lodgepole pine	Larch	Total
Inches							
6	1.21	43.41	0.07	29.34	16.71		90.74
8	0.74	3.92		2.82	1.12		8.60
10	0.52	3.13		2.35	1.13		7.13
12	0.60	2.20	0.03	1.76	0.51		5.10
14	0.46	2.10	0.03	1.34	1.87		5.80
16	0.63	1.78	0.01	1.06	0.10		3.58
18	0.60	2.14	0.01	1.03	0.25		4.03
20	0.49	1.27		0.57	0.37		2.70
22	0.62	0.93		0.34	0.01	0.87	2.77
24	0.51	1.08		0.30		0.75	2.64
26	0.87	0.59		0.29		0.25	2.00
28	0.42	0.47		0.10		0.01	1.00
30	0.50	0.31		0.10		0.01	0.92
32	0.42	0.25		0.19			0.86
34	0.28	0.20		0.07			0.55
36	0.26	0.10		0.37			0.73
38	0.12	0.06		0.01			0.19
40	0.05	0.01		0.02		0.01	0.09
Total	9.30	63.95	0.15	42.06	22.07	1.89	139.42

The scarcity of sagebrush was probably due to the frequent prairie fires set by the Native Americans, and later by the white settlers. During the latter part of August, the settlers near Emmett would take a load of straw and scatter it in windrows along the bench, then set it on fire. These fires would sometimes sweep north as far as Crane Creek before being checked by the fall rains (Smith 1983).

By 1863, the Boise Basin had become the population center of the Idaho Territory. The discovery of gold and the establishment of mining camps

brought settlers to the Boise Basin and the first cattle industry to the area. Grazing of livestock began soon after. During the 1880's, settlement continued to expand to Long Valley along the North Fork Payette River, Lowman on the upper South Fork Payette River, and the upper South Fork Salmon River (Jones 1990).

E.C. Vahlbery settled in the area around Emmett in 1880. At that time, there were ranches up and down the Payette River Valley. Bluebunch grass was the predominant species of grass and the entire country was covered with sagebrush, some of which grew as high as a man's head on the lower levels or river bottoms. The grass grew in abundance over all the hills, thick enough to make a shade cover, which helped to retain the moisture in the ground (Vahlbery n.d.).

"Gypsy bands" of sheep began trailing through in the 1870's and 1880's. Sheepmen gradually spent more and more of their time in southern Idaho, moving their headquarters there. With the arrival of the Oregon Short Line Railroad in the early 1880's, the sheep industry began to boom. Large sheep operations were set up near Boise, Caldwell, and Emmett. By 1886, bands consisting of several thousand sheep began to migrate to higher, more accessible range (Jones 1990). During the 1890's, most of the public range lands became fully stocked.

Sheep grazing began in the Basin around 1890. A story in the 1890 Idaho World stated "Boise Basin settlers accuse sheepmen of spoiling game country on Pine Creek and tributaries which they claim only until this year was full of game and was a green, beautiful mountain section. Now the natural beauties and attractiveness, as well as the game, have vanished and hunters will have to seek other sections to get venison" (Smith 1983). The rangelands were severely overgrazed by the 1900's. A 1900 Federal Census reported there were 225,207 cattle and 1,965,467 sheep on Idaho farms and rangelands (Jones 1990). Cattle numbers remained constant over time, but sheep numbers grew exponentially. Public lands were depleted of native grasses and forbs due to abusive grazing practices. Livestock were allowed to use rangeland too early in the spring before the grasses had a chance to mature (Jones 1990).

Fire—The Idaho Daily Statesman documented several fires burning in 1889. On August 6 the Statesman ran an article that stated several flumes in the outlying parts of Placerville had been destroyed by fire. Because there was no timber immediately surrounding the town, it was not in danger, but a great deal of valuable property was "in danger of destruction by the devouring element." On August 13 the Statesman reported "Forest fires are sweeping the country about Banner, Idaho, destroying some of the finest timber districts in the Territory." On August 22 the Statesman described how enough rain fell on a fire in Pine Creek to put it out. "This rain was very fortunate as the fire was making a straight shoot (sic) for flumes, etc. along Pine and Bannock Creeks." The August 24 issue indicated that Boise had been enveloped in smoke for over a month. "Reports of vast tracts of valuable timber land where the flames are raging fiercely are received every day."

On September 10 the paper reported:

> Destructive forest fires continue to devastate Boise County. The telephone on Sunday brought the intelligence that extensive fires were raging in the neighborhood of Centerville and also on the old Loon Creek trail between Banner and the Sheep Mountain country. It was feared during the afternoon of Sunday

> that a sawmill and a quartz mill, as well as some other buildings exposed, would be burned. Five wagons were accordingly loaded with men at Idaho City and sent in the direction of Centerville to fight the fires. The process known as back firing was resorted to which resulted in saving the threatened buildings. In the neighborhood of Pioneerville large fires were also threatening the destruction of extensive and costly trestlework.

The Statesman summarized the fire season in its September 13 issue.

> The year 1889 will long be remembered as a very trying one. The amount of rain fall has been so little as scarcely to deserve mention. The records of the Signal Station here show the rain fall thus far in this year to be two and a half inches below the average. This statement does not by any means express the real state of dryness, as the average rain fall during a long series of years, is scattered among portions of time where the drought is not much felt. This absence of rain has brought the forest fires which have done and are still doing infinite damage.

This issue also reported a "serious fire raging on Rabbit Creek about 10 miles southeast of Idaho City."

The first major fire occurred in 1908. A fire of unrecorded size burned on Lightning Creek and required the use of a large crew of local settlers in addition to Forest Service personnel to suppress it. Newspaper reports on August 12, 1908, stated: "Forest fires are starting up in many places in Peace Valley, originating from campers smudging mosquitos (Smith 1983). In Onion Valley, fires have been burning for several days and yesterday had burned over a space several miles square." In 1910, there was a 200 acre fire in Rabbit Creek, and a few years later, 200 acres burned in Clear Creek west of Pioneerville (Smith 1983).

Fire History—Steele and others (1986) collected fire scar data in the Boise Basin from 14 large relict ponderosa pine. They found the mean fire interval between 1700 and 1895 ranged from 10 to 22 years. Low-elevation sites burned at intervals of 10 to 13 years and moist high-elevation ponderosa pine-Douglas-fir sites burned at intervals of 16 to 22 years.

After 1891, the fire frequency changed. Three factors probably contributed to the diminished frequency: (1) smaller numbers of human-caused fires occurred after 1900 because most of the Native Americans were living on reservations and settlers were aware of the need for fire control to save buildings and standing timber; (2) organized fire suppression began in 1905 and in 1908 two fire lookouts were built in the Boise Basin; and (3) unregulated livestock grazing became widespread in the late 1800's, removing the light fuels (grass) needed for ignition and initial fire spread. Fire intervals lengthened, and allowed large, dead and living fuels to accumulate. Subsequent fires became major conflagrations that killed even the large pines that had survived other fires for centuries (Steele and others 1986).

Sloan (1994) analyzed stand history data from plots located in the Bannock Creek Research Natural Area (part of the Boise Basin). His objective was to determine how past management practices have influenced current stand conditions and what the forests in the Boise Basin looked like before settlement. The lack of fire since the 1890's has had an astounding affect on the structure, function, and composition of the stands. Before 1890, the forest was open-grown, old-growth ponderosa pine with an understory of pinegrass and elk sedge. Douglas-fir grew in the moister draws, on northern exposures and stream bottoms. These forests supported 5 to 50 trees per acre. Regeneration in the early 1900's, livestock grazing, and the lack of fire increased

the density to as many as 900 trees per acre (most stands have 250-600 trees per acre). Douglas-fir is now a major component of these stands. Fuel loading and ladder fuels have increased the risk of large, uncharacteristic stand-replacing wildfires (Sloan 1994).

In a similar study, Sloan (1996) investigated the effects of fire exclusion on a dry grand fir habitat type in the Silver Creek drainage. He calculated the mean fire interval to be 10 to 40 years. The last fire burned in 1899. Fires historically maintained the 300 acre site as a fairly open stand of mostly ponderosa pine (80 percent) with only a minor component of Douglas-fir (10 percent), lodgepole pine (5 percent), and shrubs (5 percent). The lack of fire has allowed a significant increase in the more shade-tolerant species. Douglas-fir has increased 300 percent, subalpine fir 800 percent, Engelmann spruce 1,100 percent, and grand fir 120 percent. There are 363 percent more trees today than there were in 1900. Ponderosa pine has not regenerated in this century and without intervention will disappear from the stand (Sloan 1996).

Tucker collected fire history data in Douglas-fir habitat types in Curtis Creek, Trail Creek, and Warm Lake on the Cascade RD. Ponderosa pine was the predominant seral species. The mean fire interval ranged from 12 to 14 years. She estimated a five- to seven-fold increase in the fire interval (Tucker 1995).

Deadwood, Silver Creek, and South Fork of the Payette—In 1918, W.N. Sparhawk evaluated the effects of sheep grazing on conifer reproduction on three grazing allotments (Deadwood, Silver Creek, and South Fork of the Payette). Comments follow (Sparhawk 1918):

Deadwood Allotment

The timber is largely a mixture of varying proportions of western yellow pine, Douglas-fir, and lodgepole pine, with some alpine fir, Engelmann spruce, whitebark pine, and a very few specimens of western larch. Most of the western yellow pine stands are on ridges or southern exposures between 5,000 and 6,000 feet; where yellow pine occurs on other sites it is usually scattered as individuals or groups in stands of other species. By volume, approximately 40% of the timber in this area is yellow pine, 30% Douglas-fir, 25% lodgepole and 5% other species.

The virgin stand is more or less broken by old burns and insect-killed areas, on most of which reproduction, especially Douglas-fir and lodgepole has become well established. Other openings which have been occupied by dense brush contain only scattered tree reproduction. Except on rather limited areas, yellow pine reproduction is unsatisfactory in amount. At the time the study was started (1912), there were very few seedlings of this species under 10 years old, which indicates that years of abundant reproduction are very infrequent at this altitude. There were practically no saplings over 30 years old, probably on account of extensive fires in the early 80's.

The undergrowth on the western yellow pine part of the allotment is a varying mixture of grasses, weeds, and browse:

pinegrass	arnica	geranium	lupine
huckleberry	spiraea	currant	willow
ceanothus	elk sedge	blue grass	yarrow
silver dock	fireweed	blue bunchgrass	hawkweed
paeony	valerian	bluebell	meadow rue
Indian paintbrush	penstemon	Indian tobacco	chokecherry
fire cherry	rose	mountain ash	snowberry
buckbrush	serviceberry		

Silver Creek Allotment

The timber is of much better quality than that on the Deadwood allotment, and a much larger proportion is western yellow pine. Except on the moist flats along the creek, there is no lodgepole in the stand. By volume, approximately 75% is western yellow pine, 20% Douglas-fir, and 5% lowland white fir. Reproduction is abundant and well distributed.

The undergrowth on this allotment is dense and fairly evenly distributed; browse predominates. The characteristic plants are:

ceanothus	ninebark	huckleberry	chokecherry
willows	spiraea	snowberry	rose
pinegrass	silver dock	fireweed	geranium
brome grass	meadow rue		

South Fork Allotment

The South Fork allotment represents the best western yellow pine land in this region. The trees occasionally reach a height of 190 feet. Yellow pine makes up from 70-100% of the volume of the stand, which probably averages for the entire area 85% pine and 15% Douglas-fir.

The forage cover is denser and more palatable than that on either of the other two areas. Even on the south slopes there are few of the bare spots such as are common on the Deadwood allotment, but there are more brush areas so dense that they cannot be utilized. Characteristic plants are:

wheat grass	junegrass	bluebunch grass	ninebark
brome	blue grass	ceanothus	willows
snowberry	spireae	rose	buckbrush
serviceberry	mountain ash	maple	geranium
syringa	silver dock	asters	wild carrot
sunflower	pea vine	nad meadowrue	lupine
fireweed	hellebore	brake	

Cascade Working Circle—The working circle, according to the 1924 management plan (Miles 1924), consisted of timber lying in the foothills and mountains on the east and west sides of Long Valley. Composition of the forest varied greatly between the compartments. On the east side of Long Valley, yellow pine comprised as high as 95 percent of stands, on areas as large as a section. On the west side the percentage of the other conifer species was higher. Grand fir was dominant in most of those compartments. High Valley had a good stand of yellow pine, one similar to that found on the east side of Long Valley. The South Fork of the Salmon had quite a bit of yellow pine with Douglas-fir on the north and east slopes. The benches on the valley floor were covered with a heavy stand of lodgepole pine. Each compartment was composed of the following species (Miles 1924):

Compartment	YP	DF	WF	ES	LP	L	AF
Fawn Creek	34	18	32	5	8	1	2
Van Wyck	30	14	36	10	3	2	5
Duck Creek	19	14	54	4		7	2
Tamarack	8	17	57	2	1	14	1
Gold Fork	35	21	25	7	2	8	2
Beaver	76	16	7	1			
Big Creek	57	15	22	2	1	2	1
Tripod	30	24	34	1	10		1
Clear Creek	70	26	2	1	1		

YP - yellow pine
DF - Douglas-fir
WF - white fir
L - larch
AF - alpine fir
ES - Engelmann spruce
LP - lodgepole pine

Grazing—The first extensive use of forage was by cattle and horses. Beginning in 1836, thousands trailed through the Caribou area over the Oregon Trail. In 1863, there were cattle in the Bear Lake settlements, along the Portneuf, and in the Malad and Cache Valleys. Larger range cattle outfits entered the area about 1868, coming up from Utah and Nevada. By 1875, there were large numbers of cattle. The "War Bonnet" outfit owned by H.G. Rand had 15,000 head. Sheep first appeared about 1883 when grazing began along the Snake River; by 1893 there were large numbers. The area now in the Caribou National Forest was fully stocked by sheep by 1900, and overstocked by 1905 (Varner 1945).

The first permanent settlement of Soda Springs was May 23, 1863, at a point on the Bear River below the present town site. Cattle and horses were grazed in the immediate vicinity of the settlement. By 1905, 150,000 to 200,000 head of sheep ranged around Soda Springs (Varner 1945).

In 1935, Abe Anderson was interviewed by Ranger Peterson about the range conditions in Caribou County. He was born in Soda Springs in 1865, and was involved in the livestock industry for many years. The following is an excerpt from the interview (Anderson 1935):

> Grass grew so luxurious on the range north of Soda Springs that when a cow would lie down you could see where the grass was down for the remainder of the summer. The dry grass on this range became a fire hazard during the autumn months, and prairie fires used to sweep across the country because of the large amount of grass left in the fall. Bunchgrass grew on the grazing land to an approximate height of 16-18 inches. In 1885 and 1886 the sheepmen began to bring in the large numbers of sheep to graze on the land that is now the Caribou Forest and the Soda Springs Lease. These sheep came in the following years by the thousands, and the forage was pretty well consumed by the grazing of so many animals. The trailing of all these sheep over the range probably did it more damage than the actual grazing.

A.J. Knollin started in the sheep business in 1894, and recalled grass and weeds grew to 2 to 2.5 feet in height. R.C. Rich and J.W. Woodall concurred that forage in the sagebrush type would actually reach a height of about 2 feet (Varner 1945).

One of the early settlers of American Falls, Mr. Philbrick, documented the range conditions during the late 1800's and early 1900's (Philbrick 1937).

> Forage was all bunchgrass with no junegrass in the early days. The bunchgrass was not scattered and produced hay averaging from ½ to ¾ ton per acre. There was little grass such as rye and spear grass. Bunchgrass disappeared from several causes. One was grazing. Some areas were grazed before the seed ripened. The next seasons were dry. The final ending of it was the junegrass, which crowded it out. Weeds then came along and have taken the moisture out of the ground. Sagebrush is traveling up the mountains in most localities. There was no sagebrush in the hills at first. Just in the valleys. First there was meadow along the creeks. Next, sagebrush from 2 to 10 miles from the Snake River. Then bunchgrass and mountain shrubs. Soon, however, the sagebrush area became wider.

Sheep outfits ranged on the foothills to the east of Rexburg and as far east as Thousand Springs Valley on the Targhee. By 1893 to 1895 the sheep were taken to the higher mountains for summer range. By 1896 range deterioration was noticeable. The bluebells, broadleaf, and better forage plants were

being replaced by grasses and inferior weeds. Overall, the grass species changed from the finer to the coarser species. Porcupine grass replaced the wheatgrasses and buffalo grass (Ricks n.d.). In the early days of grazing, the high mountain ranges were not eroded. At the peak of stocking (1896-98), considerable erosion was evident. By the time the Forest Reserve was created, there was noticeable overgrazing on all lands, public and private. A large number of the sheepherders were transients who did not care whether or not the range was preserved and used all they could (Varner 1945).

The first Forest Supervisor, John Wedemeyer, recognized the overstocking, and in 1907 recommended a reduction in permitted use from 456,000 sheep to 400,000, even though he received an application for 740,000 sheep. In 1908, he reported the seven ranger districts actually grazed a total of 387,395 sheep, 10,781 cattle, and 438 horses (Varner 1945). The seasons of use were: cattle - April 15 to December 31, sheep - May 1 to October 15.

Timber—Table 8 summarizes the number of acres by size class and cover type for the Forest in 1915.

Bear Lake Valley—It is estimated that from 1870 to 1900, 500 million bd ft were removed from 150,000 acres around the Bear Lake Valley. Demand was greatest when the railroad was built through the Valley (Anonymous n.d.a).

Malad Forest Reserve—A 1904 proposal for the Malad Forest Reserve described the conditions on the 94,390- acre tract. Approximately 5,000 acres had commercial timber, while 89,321 acres were covered by a dense growth of brush and woodland stands. Douglas-fir, the principal species, occurred at the heads of the canyons and depressions on higher slopes. Stands were uneven-aged with a fair amount of young growth. Average tree diameters were 2 to 8 inches. Lodgepole pine saplings were mixed with Douglas-fir on the upper slopes in the sheltered canyons, generally on northern exposures. White fir grew at the head of the canyons on the upper slopes, mixed in with the Douglas-fir. Trees ranged from 8 to 13 inches in diameter, with little or no young growth. Lodgepole and white fir comprised only a small percentage of the stand (Riley 1904).

Mahogany, cedar (*Juniperus occidentalis*), and pinyon (*Pinus monophylla*) grew in open stands on the dry, lower slopes. They were highly valued for fuel, so they were cut heavily wherever possible. The brush was a dense growth of sage with patches of chaparral composed of aspen, serviceberry, maple, and oak. Sage was everywhere in the open areas, and its density was determined largely by exposure. On sheltered sites bushes were large and dense; on exposed ridges and open slopes, bushes were stunted and scattered (Riley 1904).

Commercial forests consisted of Douglas-fir with some lodgepole and white fir. Stands were uneven-aged and most were cut over for sawlogs. Large quantities of house logs, poles, and fuel were removed each year (Riley 1904).

Woodlands were covered by a dense growth of aspen, chokecherry, maple, oak, and serviceberry. On lower, exposed slopes there were mountain mahogany, cedar, and pinyon. At the head of Clarkston Creek, were scattered patches of small, stunted Douglas-fir. Deep Creek provided large quantities of fence poles. Areas classified as brush were covered by black sage with dense patches of maple, oak, ceanothus, and chokecherry from 4 to 10 feet in height (Riley 1904).

Table 8—Number of acres by cover type for the Caribou National Forest in 1915 (Forest Service 1915b).

Township	Range	Douglas-fir			Lodgepole pine			Spruce		Sub-alpine fir	Scattered all species	Aspen	Grass	Sage	Barren	Brush	Total acreage
		Merch.	Poles	Saplings	Merch.	Poles	Saplings	Merch.	Saplings								
2N	42E	196									622	830	89	1,948		106	3,791
1N	41E	56										922	110	2,488		320	3,896
1N	42E	1,510	64							246	3,632	2,225	249	1,3791		1,135	22,852
1N	43E	961		346							428	5,814	4,786	7,253		876	20,464
1N	44E	200		30							265	2,421	2,012	438		92	5,458
1S	42E	566									26	5,040	3,173	6,300		184	15,289
1S	43E	1,368		359							1,260	5,814	1,912	7,253		676	18,642
1S	44E	418		208						167	4,802	1,392	2,207	2,822	402	9,151	21,569
1S	45E			32			840				916	2,195	1,351	630	15	4,063	10,042
2S	42E	444				52						521	134	1,289			2,440
2S	43E	188			2,919	1,242	388				1,399	6,435	1,292	6,670		2,507	23,040
2S	44E	747		2,149		400					1,039	478	5,024	4,392	112	8,497	22,838
2S	45E	2,110		187						320	2,307	3,288	1,717	3,516	116	7,575	21,136
2S	46E	80		63							117	131	10	363		300	1,064
3S	43E				1,007	1,276	294			16	176	3,191	567	3,043		33	9,603
3S	44E	54			33	2,759				1,168		6,182	810	10,711	8	943	22,668
3S	45E	2,086			1,412	2,440				96	4,106	1,855	1,369	5,799	44	3,537	22,744
3S	46E	518		376	2,033	620					1,670	2,047	542	746		1,556	10,108
4S	43E											680	194	220		28	1,122
4S	44E	1,175	80	136	160	1,624				2,088	847	8,371	4,943	726		2,080	22,230
4S	45E	1,432		248	341	1,443	259			78	4,145	4,885	423	4,397		5,197	22,848
4S	46E	773		64		447	466				745	3,385	329	2,881		1,943	11,033
5S	43E	114			276						413	2,266	2,190	355		346	5,960
5S	44E	663	42	147		64	443					7,300	1,240	3,817		357	14,073
5S	45E	1,779	54	1,187		516					620	11,946	622	5,183	26	743	22,676
5S	46E	320	70	1,000							113	4,865	136	2,295		104	8,903
6S	43E	1,374		22		130					3,228	2,605	565	4,185		51	12,160
6S	44E	1,592		4		5,101	59					3,357	202	1,467		826	12,608
6S	45E	1,004		962	636	4,789	12					5,979	2,798	4,318	290	2,252	23,040
6S	46E	464		351		622						7,041	357	4,228	27	1,240	14,330
7S	43E	90			8	24	16				1,015	1,330	537	2,592		34	5,646
7S	44E	944		124		173	988				337	3,256	612	3,979	28	108	10,549
7S	45E	300		390	257	6,191	1,949				575	6,333	788	4,067	12	682	21,544
7S	46E	812		68			1,818					1,415	68	3,155		162	7,498
34N	119W	456		192		122						807	23	788	6	34	2,428
33N	119W	242		68		476						1,935	741	1,121		380	4,963
8S	43E	502		213								1,536	334	2,098		117	4,800
8S	44E			37			1,164			121		6,004	692	5,297	54	231	13,600
8S	45E	1,424		1,015	733	2,889	3,043	277	47			7,423	563	4,097		1,529	23,040
8S	46E	452				761	904					3,204	72	1,752		135	7,280
9S	44E	949		151		1,241	211					8,207	1,197	7,334		710	20,000
9S	45E	1,429	783	2,183		2,214	553			310		7,341	573	4,046		3,608	23,040
9S	46E	115				143						3,211	405	2,606		330	6,810
10S	43E			203			338					767	1,871	935		366	4,480
10S	44E	373	74	3,012		165	1,577					2,586	4,839	5,285		4,169	22,080
10S	45E			17	78	1,384	2,288	167	88			4,827	915	3,006	254	1,878	14,902
10S	46E	155		61		10						1,793	1,768	2,104		752	6,643
11S	44E	621		899								1,144	847	3,103	247	3,379	10,240
11S	45E	1,007		2,207			174					1,194	790	10,218	98	1,272	16,960
12S	44E	260		625								105	1,214	1,009		627	3,840
12S	45E	681		436	103	85	1,223					2,306	1,162	15,676		724	22,396
13S	45E											1,054	1,414	22,632	20		5,120
Total acreage		33,004	1,167	19,772	9,996	9,403	19,007	444	135	4,610	34,803	181,239	63,169	200,033	1,759	77,945	686,486

Portneuf/Elkhorn/Oxford/Pocatello Divisions—The Forest was surveyed during 1910 (Portneuf Division), 1911 (Elkhorn/Oxford Divisions), and 1914 (Pocatello Division). Information was gathered predominantly on the commercial tree species. The information common for all Divisions is summarized below.

Trees of Considerable Local Value:

Douglas-fir	(red fir)
subalpine fir	(balsam, balsam-fir)
aspen	
mountain mahogany	
Utah juniper	(cedar)

Trees of Lesser Importance:

limber pine	(nut pine, pinion, pumpkin pine)
Engelmann spruce	
Balm of Gilead	(*Populus balsamifera*)
narrow leaf cottonwood	(*Populus angustifolia*)
large-tooth maple	(birdseye maple, *Acer grandidentatum*)

Shrubs:

sagebrush	
New Jersey tea	(chaparral, *Ceanothus velutinus*)
snowberry	(*Symphoricarpos*)
buckbrush	(*Pachystima myrsinites*)
western serviceberry	(*Amelanchier alnifolia*)
western chokecherry	(*Prunus virginiana*)
hawthorn	(hawberry-*Crateagus* sp)
mountain birch	(*Betula occidentalis*)
mountain alder	(*Alnus*)
elderberry	(*Sambucus racemosa*)
red dogwood	(*Cornus sericea*)
current (red)	(*Ribes montigenum*)
current (yellow)	(*Ribes aureum*)
current (purple)	(*Ribes inerme*)
sumac	(*Rhus* spp.)
willow	(*Salix* spp.)

Portneuf Division—The Portneuf Division was surveyed in 1910; excerpts from the survey follow (Forest Service 1910b):

> In the upper partially enclosed drainage basins of Toponce and Pebble Creeks, the principal timber tree (Douglas-fir) finds its best development. Above 7,000 feet in elevation, the west and south slopes occasionally bear a growth of small scattered, unmerchantable timber. At 6,500 to 7,000 feet on the east, south and west slopes there is a mixed growth of Utah juniper and mountain mahogany. The south and west slopes, and north and east slopes below 6,000 feet, support only a ground cover of sagebrush and other drought resistant shrubs.

	Area	% of whole
subalpine type	8,370	9.5
Douglas-fir type		
aspen subtype	23,772	27.0
DF subtype	14,482	16.5
mahogany-juniper type	1,915	2.5
grazing land type	39,070	44.5
Total	87,609 acres	

> The subalpine type occurs only on main ridges above an elevation of 7,500 feet. As altitude becomes lower near the lower limit of the type, the Douglas-fir enters more and more into composition until finally it displaces the subalpine fir entirely.

Reproduction is good, and young growth is usually abundant. On favorably exposed sites on the ridges, tree growth is usually short and scrubby, occurring either singly or in small dense groups.

The Douglas-fir subtype grows at elevations of 6,500 to 7,200 feet. At higher limits it occurs in dense stands on the steep slopes with a northeast aspect. At lower elevations the Douglas-fir often occurs on more level flats in scattered stands and usually accompanied with an understory of aspen. In two or three locations within the Division below 7,000 feet, lodgepole pine is found in this type, either as scattered fire-scarred, mature trees or as very dense reproduction.

The aspen subtype usually grows below the Douglas-fir subtype and mixed in with it. It may also occur as high as 7,400 feet where it grows more as a transitory type following fire. The common occurrence of Douglas-fir reproduction under aspen in all locations in close proximity to Douglas-fir seed trees, leads one to believe that Douglas-fir can be propagated and grown wherever aspen occurs.

The mahogany-juniper type occurs only on the very driest low, limestone ridges in the eastern and southeastern part of the Division. Reproduction is absent.

The grazing land type includes upland meadows and high non-timbered mountain ridges, which always bear a dense growth of herbaceous plants.

The survey broke the Division into blocks, compartments, and lots, each category a subset of the previous one. The Portneuf Division was divided into seven blocks. Portions of the block, compartment, and lot information are summarized below (Forest Service 1910b):

Block I covers the Toponce Creek watershed. Compartment A comprises the watershed of the North Fork of Toponce Creek. The watershed occupies a basin formed by Mt. Putnum on the north (just outside the Division), the main divide of the Portneuf on the west, and by an eastern outlier from this divide, which separates the North Fork from the South Fork on the south.

Lot 1 is a stand of largely single trees, often mature, occurring in an understory of aspen. At the upper edge in sheltered coves, the subalpine fir forms a considerable stand. Reproduction is of fair density. Lot 6 occupies the flat surrounding a low ridge. South of the ridge the timber is scattered mature Douglas-fir among aspen. North of the ridge the stand is largely of medium age with occasional mature large trees. The stand here is 75% Douglas-fir and 25% lodgepole. The lodgepole is largely immature and often fire-scarred. Lots 4&5 are stands of pure Douglas-fir of density varying from scattered at lower elevations to dense in places near the top of the slope. Timber is largely mature with fair reproduction. Lot 7 is composed of scattered Douglas-fir on a north slope. The timber is mostly mature and reproduction is coming in under the aspen cover. Lot 8 is largely subalpine fir.

Compartment B is located in the basin of the South Fork. There are aspen stands with an overstory of scattered Douglas-fir on the north slope of the divide separating Pebble and Toponce Creeks. The western portion of the basin is cut up by numerous short, broken ridges lying eastward from the low divide between Rapid and South Fork of Toponce Creeks. The north slopes of these ridges support a middle-aged stand of Douglas-fir with aspen following the small streams between, while the south slopes are usually covered with sagebrush.

Lot 5 is a considerable stand of fire-scarred, scattered, mature lodgepole which should be removed. Lot 8 is an area that has been burned within the last 20 years. Fire killed only a part of the former stand leaving scattered Douglas-fir trees of about 18 inches dbh, badly fire-scarred. Lots 2&3 are typical stands of scattered mature Douglas-fir in aspen.

Compartment C is largely sagebrush or grazing land with an area of aspen on the east slope of the low ridge lying north of Toponce Canyon.

Block II covers the watershed of Pebble Creek. This block has the best stands of merchantable timber in the Division. Compartment A is similar to Block I. Beginning at an elevation of 6,400 feet, the moderate aspen covered slope stretches up toward the main high ridge to the west. The east and north slopes of

the easterly outlying ridges are well clothed with a dense stand of Douglas-fir where fire has not gained access and destroyed the original stand.

Lots 2-5 and 8 are typical stands of mature Douglas-fir occurring as scattered groups and single trees in an understory of aspen. The greatest hindrance to quick reproduction is the presence of pine grass. Lot 10 is a dense stand of small Douglas-fir that have an 8 inch average dbh. No reproduction is present. Lot 11 is a middle-aged stand of Douglas-fir. A severe fire some 25 years ago nearly denuded the steep slopes of Big Canyon. The east slope is restocking fairly well except near the head of the canyon, while on the west the grass and herbaceous plants seem to be taking the area, probably owing to the absence of seed trees immediately following the fire.

Compartment B is the South Fork of Pebble Creek where the heaviest and largest body of merchantable timber within the Division is located. The average dbh is 18 inches. The stand is about 60% Douglas-fir, and 40% subalpine fir at the lower elevations but the proportion of subalpine fir increases as altitude increases. The timber is even-aged (~135 years) with very little reproduction. At an elevation of 6,400 to 6,600 feet, Douglas-fir average 30 inches and are so large as to be handled with such difficulty with the limited means at the command of the small sawmill operators that at present there is no market for these large trees. Above the head of the South Fork, the steep eastern slope of the main range supports scattered patches of subalpine fir and occasional single trees.

Block III includes the east slope of the secondary ridge between Toponce and Pebble Creeks and includes the King Creek drainage area as well as other short, intermittent streams to the south. A few small bodies of timber are contained within the block. These are located in the extreme heads of the larger streams where a basin is formed between and back of two outlying points from the main ridge. The northern slopes of these basins support a growth of Douglas-fir usually of fair density, but often immature. The aspen stands within these small basins are rapidly being restocked by Douglas-fir. The mahogany-juniper type occupies the top of the ridge with the stand characteristic of this type.

Block IV comprises the remainder of the Division that drains eastward into the Portneuf. At one time, the north slopes of all these rocky canyons were covered with a considerable stand of Douglas-fir. Some 12 to 15 years ago a severe fire totally denuded the timber from the largest of these canyons so that now only occasional clumps of reproduction are found. Fully 75 years will be required to secure a complete cover and more sure results will ensue from planting Douglas-fir and ponderosa pine. Farther south where fires haven't burned, the timber is immature and of fair density. The average size is 12 inches dbh with very little reproduction. The tops of these ridges bear a scattered growth of mahogany and juniper.

Block V includes the drainage areas of Beach and Bob Smith Creeks. Beach Creek contains a small area of Douglas-fir timber on the east slope of the high ridge separating Beach and Bob Smith Creeks. The stand is rather scattered and immature. Lower-edge aspen comes in and extends down into the stream bottom. The balance of the watershed is made up of low ridges covered with sagebrush. The east side of Bob Smith Creek watershed is largely mahogany and juniper. The more sheltered locations have scattered Douglas-fir. In the upper portions of the canyons on the east of Bob Smith Creek, a considerable stand of Douglas-fir occurs. The west side of the watershed has very little timber, and currently has immature growth in small patches. At the extreme head of the main canyon is a body of mature timber, largely subalpine fir.

Block VI is the portion of the west slope of the Portneuf Range, including the small drainage areas of an aggregate of small streams. Compartment A includes the west slope from Lower Rock Creek south to the southern Forest boundary. The east side of this watershed is completely clothed with a dense stand of immature Douglas-fir. The west side of the watershed supports a scattered stand of stunted Douglas-fir growth. On the upper portion of the east slope of the low, outlying ridge to the west, two small patches of very good timber are located. The stand is 60% Douglas-fir and 40% subalpine fir. Reproduction is fair, largely subalpine fir.

Lot 6 is pure, dense, mature Douglas-fir with an average dbh of 16 inches. Lot 3 is a small body of scattered, medium sized Douglas-fir. A burned area north of Lot 3 is being restocked with subalpine fir at the upper end.

Compartment B comprises the west slope of the main ridge from Lower Rock Creek to the ridge south of Rapid Creek. Scattered Douglas-fir grow on the upper portions of the slope. Lots 4-8, 9 are small bodies of immature Douglas-fir in comparatively dense stands on northwest slopes bordering ravines at the heads of small streams. They average 10 inches in diameter. Considerable dead timber exists as a result of former fires. At the head of Lone Pine Creek, a considerable area has been burned over some 20 years ago. Reproduction is almost entirely lacking. The remainder of the compartment has sagebrush interspersed with small stands of chaparral and aspen on the numerous small, north slopes.

Block VII comprises all of the Division west of the main range and north of and including Rapid Creek. Compartment A includes Rapid Creek watershed. Timber is largely mature Douglas-fir, scattered with an understory of aspen. Reproduction is scattered. The small area of reproduction on the south bank of the stream at the bend is lodgepole pine, about 25 years old, following fire. Near the boundary of the Division, large, mature, balsam poplars 38 inches dbh are present.

Compartment B covers the watershed of East Fork of Rabbit Creek. Lot 7 is a stand of scrubby subalpine fir, partially fire-killed. Lot 6 is a remnant of a tract of subalpine fir that, before being burned, covered the entire north slope of the ridge upon which it is found.

Compartment C is the corner of the Division draining westward into the North Fork of the Rabbit Creek watershed. It is composed of mature, scattered trees, with fair reproduction coming up from beneath. The remainder of the Block is a succession of sagebrush covered south slopes and chaparral and aspen covered north slopes, except where fires have burned off the original stand of timber.

Pocatello Division—The Pocatello Division was surveyed in 1914; excerpts from the survey follow (Forest Service 1914):

Douglas-fir is either in pure stands on steep slopes, or scattered with aspen on slopes of a gentle northeast exposure. Aspen grows on northerly slopes along with Douglas-fir and maple. Mountain mahogany and Utah juniper occur on low limestone ridges.

	Area	% of whole
Douglas-fir type	2,622	5
Douglas-fir subtype	6,417	13
aspen subtype	6,986	14
mahogany-juniper type	1,704	3
grazing land type	28,422	58
Total	46,151 acres	

The Douglas-fir stands in the Douglas-fir subtype are pure at 6,000 feet, at 6,400+ feet Douglas-fir is mixed with scattered subalpine fir. Douglas-fir usually occurs in these stands as small individuals with an average dbh of 18 inches and 60-80 feet tall. Very little reproduction or ground cover is found. Douglas-fir is scattered in the understory of aspen. Reproduction is usually present in sufficient quantity to care for the areas.

The aspen subtype does not currently support a growth of Douglas-fir, but sites show potential for growth. Also included are areas now bearing chapparral and other brush.

The mahogany-juniper type is made up largely of juniper rather than a mixture of mahogany and juniper. Reproduction in mahogany stands is very poor. Juniper reproduction is better, but in most instances not plentiful. On bench lands in sections 2 and 11, the reproduction of juniper is rapidly spreading.

The grazing land type is composed of sagebrush-covered ridges and flats, and on higher ridges, numerous areas support a growth of mountain bunchgrass.

Block I includes all of the Division north of Gibson Jack drainage and east of the county line ridge. On the head of Indian Creek, there was at one time a

considerable area bearing a very satisfactory growth of Douglas-fir. Within the past 25 years, fire has killed all the upper portion of the timber and seriously injured what remains.

Block II includes the Gibson Jack watershed. The bottoms are filled with a narrow strip of aspen and brush. The tops of the ridges bear a scattered growth of Utah juniper and the slope and lower flats a dense growth of sagebrush and other drought resistant shrubs. Lot 1 is an immature stand of Douglas-fir with an average diameter of 12 inches. Fire has denuded part of the stand. Lot 2 is largely a mature stand with an average diameter of 18 inches. Lot 3 is timber scattered in groups and single individuals. Along the steep slopes, fire has killed the greater part of the stand leaving an occasional fire-scarred tree. Reproduction is scattered through the brush. Lot 4 has Douglas-fir in scattered small coves and patches. Part has been burned. Near the burnt area, the timber thins out and is composed of fire-scarred trees scattered among a heavy stand of chaparral. Reproduction is good and thrifty. Lot 7 has a portion of timber killed by fire. Areas of brush adjacent to Lots 6 and 7 occupy space once timbered, but later denuded by fire. Some scattered reproduction is present. Lots 8-10 are immature Douglas-fir with an average dbh of 10 inches. Parts of 9 and 10 have been burned, leaving very few live trees. Lot 11 is in a gulch where the stand of Douglas-fir was partly burned.

Block III includes all of the Mink Creek drainage. Compartment A is the West Fork. Lots 1 and 2 have scattered mature, Douglas-fir that grow in small groups. Fire at one time burned through, killing a large part of the timber and injuring about half of the remaining stand. Reproduction is fair. Lot 3 has timber in shallow gulches and is mostly mature with sufficient reproduction. Lots 4-6 are covered with mature timber with an average 16 inch dbh. An area ~10 acres has been killed by fire. Along the creeks trees of considerable diameter, up to 40 inches, are found occasionally, but usually not over 90 feet with an average height of 75 feet.

Compartment B includes the South Fork and west side of the main fork below the junction of the East Fork. In Lot 1 the timber varies from mature trees up to 24 inches dbh to small poles under 6 inches with the immature timber greatly in the majority. The area has been burned over sometime ago, leaving a scattered stand, and reproduction has grown back. Lot 2 is a typical stand of scattered mature Douglas-fir in a heavy stand of aspen. Reproduction is coming in slowly under the aspen and will take over probably within 25 years. Lot 4 has timber that is mostly mature and reproduction is fair. Lot 5 was burned over some years ago. It contains very little merchantable timber. Considerable amounts of young timber and reproduction is found among the brush.

Compartment C is the area drained by the East Fork and the area east of and draining into the main creek. Lot 1 has trees that average 15 inches dbh and about ⅓ of the stand is mature, the remainder is under 14 inches and thrifty. Lot 3 is an uneven-aged stand and varies from 6 to 28 inches dbh. Near the upper edge of Lot 6, subalpine fir begins to mix in with the Douglas-fir, occurring usually as dense groups of immature trees approximately 10 inches dbh.

Block IV is west of the main divide. Outside of the Midnight and Crystal Creek basins, the Block is characterized by the uniform lack of timber. Compartment A includes the area draining directly west into the Bannock River. It is composed of aspen and brush along streambeds and at the heads of gulches. Michaud Creek has the larger portion of the brush type within the compartment.

Compartment B includes the drainage basins of Midnight and Crystal Creeks. The upper portions of both support a dense stand of Douglas-fir on slopes having a northerly or easterly aspect. Lot 1 has mature Douglas-fir scattered in clumps along the head of Midnight Creek. The trees are large and mature, about 24 inches average dbh. Generally, there is very little reproduction. There is very little small timber to be found. Lot 3 is an uneven-aged stand composed of very large and mature trees with a mixture of younger, immature Douglas-fir trees. The largest individuals on the Division are found in this gulch. One tree was at least 50 inches dbh. The timber will average about 24 inches. Reproduction is fair. Lot 5 is a stand of Douglas-fir of about 14 inches average dbh in a stand of aspen. Reproduction is fair and well-distributed. Lot 6 is a typical two-story aspen and Douglas-fir stand. Douglas-fir is unevenly scattered over the area. Timber is largely mature with

sufficient reproduction. Lot 9 is a fairly dense stand of Douglas-fir. At one time it was much heavier than at present. Fire has killed part of the stand.

Elkhorn and Oxford Divisions—These Divisions were surveyed in 1911; excerpts from the survey follow (Forest Service 1911):

Generally, the true forest on the Elkhorn and Oxford Divisions is limited to the north, sheltered, steep slopes of the numerous side canyons or gulches radiating out from the higher mountains, especially with Mt. Elkhorn and Oxford Mountain as a center. The timber occurs chiefly in the steep-slope-dense-stand types rather than on scattered aspen flats as in the case on the Pocatello and Portneuf Divisions. Timber is mostly pure Douglas-fir, except above an elevation of 7,500 feet where the subalpine fir mixes with Douglas-fir. Subalpine fir is found mostly on the sides of the two large mountains. Since the timbered areas have been closely culled out, the timber now present is immature, usually less than 10 inches dbh. On the greater portion of the Birch Creek basin, the once heavy stand of timber has been entirely cut away followed by burning, leaving only a field of stumps. Aspen and chaparral cover all areas on north slopes not covered with timber, and are found on all abrupt north exposures below 6,500 feet. Mahogany and juniper are found on dry limestone slopes (usually southern exposure). Other areas are densely covered with sagebrush and other drought resistant shrubs.

Elkhorn Division

	Area	% of whole
Douglas-fir type	5,920	11.5
aspen subtype	11,187	21.5
mahogany-juniper type	5,412	10.5
grazing land type	22,903	44.5
Total	45,422 acres	

Block I is on the north end that has no timber. A few scattered mature Douglas-fir are near the tops of the gulches. Block II is on the west side of the divide between Wright's and Indian Mill Creeks. Generally, all timber has been culled. Lots 1&3 are immature and scattered Douglas-fir stands on steep slopes. Reproduction is good. Lot 2 is large, mostly mature Douglas-fir that is scattered in aspen. Lot 4 has mature Douglas-fir that average 18 inches dbh. Lot 5 is mostly immature timber, slightly over 50% is subalpine fir. The head of the Lot is entirely burned over with poor Douglas-fir reproduction. Lot 6 is mostly immature Douglas-fir that averages 10 inches dbh with a large number of 6 inch dbh. Fire has killed most of the timber in Lot 8, and reproduction is very good. Sixty-five percent of the stand is Douglas-fir and 35% is subalpine fir. Lot 9 is a scattered stand of Douglas-fir, and reproduction is poor. Fire has denuded the area in Lot 10, and reproduction is poor. Lots 11-13 were formerly steep slopes covered with Douglas-fir. All have been severely culled of all merchantable material, leaving a stand of Douglas-fir under 12 inches dbh. Lot 12 is practically bare of timber, but some reproduction is present among the ceanothus. Lots 15 and 16 are at the heads of gulches and have Douglas-fir trees but the stands below have been burned. The timber is largely mature. Lot 17 is an immature stand composed largely of Douglas-fir (80%) and the trees average about 11 inches dbh.

Block III is the portion of the Division that drains into Marsh Valley. Compartment A is the part not draining directly into Birch Creek or North Canyon. Fire burned the larger part of the original timber in Lots 1 and 2. The remaining trees are under 12 inches dbh. Douglas-fir reproduction is coming in among the chaparral. Compartment B is the area draining into Birch Creek and North Canyon. Lot 1 is the remnant of a stand that used to cover the whole south side of North Canyon. Thirty percent of the current stand is subalpine fir. The timber is uneven-aged, large mature trees intermingled with undersized material. Lot 2 is a small patch of timber marooned by fire that denuded the sides of the canyon after logging. This lot has been culled, and immature Douglas-fir with 25% subalpine fir remains. Chaparral has taken over Lot 3. Occasionally a lone fire-scarred tree remains. Clumps of reproduction are scattered.

At one time practically all north slopes within Birch Creek basin were covered with a very good stand of timber. Continuous heavy cutting, followed by fire, has resulted in all but the extreme upper gulches being entirely denuded. Very little reproduction is to be found except in occasional patches and coves.

Lot 9 is a stand of Douglas-fir (75%) and subalpine fir (25%) that averages 12 dbh. It has been mostly culled of the largest trees. Lot 13 has been culled due to a fire burning through the stand. Lot 14 is a stand that has been culled of Douglas-fir but the remaining stand is 100 years old and 12 inches dbh. Lots 16 and 18 have been burned. Lot 19 was heavily culled of merchantable timber, and in places burned over. The remaining timber is 12 inches dbh. Lot 20 was cut clean and is overgrown with chaparral, and very little reproduction is present. Lot 21 is part of a large recent burn that came up from Kent Canyon from the south and burned a stand of Douglas-fir stand of about 12 inches dbh.

Block IV is an area draining westward, south of Block II. It has the only areas of unculled timber found on the Division. Compartment A includes the watershed of Indian Mill Creek and two short gulches just south. Indian Mill Canyon once contained the largest and best body of timber found in the Division. Logging has carried on for at least 25 years, and the fire that destroyed the old Indian Mill undoubtedly destroyed more timber than has been cut. Lot 1 is overgrown with chaparral. Lot 2 has no reproduction and very little brush. Lot 4 has 15% subalpine fir, 10% limber pine, and 75% Douglas-fir. Timber is mature and is about 16 inches dbh. Lot 8 has 75% Douglas-fir and 25% subalpine fir. The trees average 8 inches dbh and 60 feet tall. Lot 9 was partially burned.

Compartment B is the Bill Morgan Canyon area. Lot 1 is overmature timber (80% Douglas-fir and 20% subalpine fir) that averages 18 inches dbh. Lot 2 is thoroughly culled of all material over 12 inches dbh. The culled areas support a growth of brush with a fair stand of reproduction and 50 trees per acre (8 inches dbh). Lot 3 is nearly pure Douglas-fir with a 10 inch dbh average. The lower half of the lot has been culled of all merchantable material to a dbh of 12 inches.

Block V is the portion of the Division draining southward into Devil Creek. Compartment A is the portion of the Block draining directly south. Lot 1 has immature Douglas-fir timber (10 inch dbh). Lots 2 and 3 have been heavily cut. Lot 4 is covered by chaparral following heavy cutting with considerable reproduction and occasional large trees scattered. Lots 7, 10, 11 have trees that average 11 inches in diameter since all merchantable trees have been cut. Lot 9 is covered with brush that grew back after logging and fire.

Compartment B is the portion of the Block draining eastward into the head of Devil Creek. Lot 1 has immature trees of ~10 inches dbh. Lot 2 is covered with brush following logging and fire.

Oxford Division

	Area	% of whole
Douglas-fir type	3,514	4
aspen subtype	22,646	24
mahogany-juniper type	7,003	7
grazing land type	48,290	51
Total	81,453 acres	

Timber was confined largely to the immediate vicinity of Oxford Mountain. A few small steep-slope types center around the high mountain areas around Weston Peak. Block I includes the Cherry Creek watershed and main ridge north of Oxford Mountain. Compartment A includes the Cherry Creek drainage. All merchantable timber has been removed down the creek in Lot 2. Steep slope type Douglas-fir stands support a scattered stand of immature timber. The larger timber remaining averages 10 inches dbh. Lot 3 has a scattered stand of immature Douglas-fir in an understory of aspen. Compartment B is Aspen Creek and the divide east of it. Block II is the east side of the divide from Gooseberry Creek south to Weston Creek. Compartment B is the portion of the Block extending south to Weston Creek. Lot 1 is immature Douglas-fir grouped irregularly over the area. Lot 7 is Douglas-fir reproduction following a fire which burned the original stand.

Block III is the west side of the high range south of North Cherry Creek. Compartment A includes New Canyon basin and the extreme upper basin of the main fork of North Cherry Creek. Lots 1 and 2 were culled 10 years ago. No merchantable timber present. Lot 9 is culled and burned leaving only a stand of brush with scattered reproduction. Compartment C includes the Weston drainage from the higher range. Block IV is the low country south of Deep Creek to the Clarkston Creek basin and Utah line. The timber is immature, about 10 inches dbh but is enlarging the area by means of reproduction in a very satisfactory manner. Reproduction is thrifty and of good density and distribution. Block V includes the Clarkston Creek drainage and Utah portion of the Division. Timber has been clear cut, leaving only a scant stand of reproduction. Lots 2-6 are heavily cut over and almost denuded of timber.

Cache National Forest (Old)—A portion of the old Cache National Forest was absorbed by the Caribou National Forest. Prior to the change in administrative boundaries, the Cache was surveyed. A Silvicultural Plan was written (Forest Service 1913). Portions are highlighted below:

> The brush type is made up of mountain mahogany, junipers, and sagebrush. A considerable amount of good grasses and weeds are associated with it and often furnish excellent sheep and cattle grazing. This type is found along the borders on the northern and southern extremities of the Forest, running from the lowest to the highest elevations.
>
> The broad-leaved type is composed of quaking aspen, willows, cottonwood, maples, alder, and critigrises [sic]. This type takes in all the deciduous species. It is found generally distributed over the Forest in moist situations in the bottom of canyons and along the streams. It ranges from mere scrubby bushes to merchantable aspen trees.
>
> The lodgepole pine type consists mostly of even-aged stands of pure lodgepole pine. The type is found in the heads and on the north slopes of the canyons draining into the Bear Lake Valley and on the east slopes of the main divide. The stands have 25 to 50 trees per acre and are 6-12 inches dbh.
>
> The spruce and fir type consists of Engelmann spruce and subalpine fir in mixture. It is exceptional to find pure spruce stands, but not pure subalpine fir. This type monopolizes the moistest portions of the Forest above an elevation of 7,000 feet.
>
> The Douglas-fir type is composed of pure or nearly pure stands of Douglas-fir, and is the most valuable type commercially. On the very highest elevations, limber pine is associated with this species. It usually covers the ridges and the south slopes of the canyons and is scattered on the west slope of the main divide. It is also found in the bottom of the canyons.

Range Conditions—In 1922, a Range Classification Report was written for the Pocatello Division of the Cache National Forest. The following excerpts are from the report (Forest Service 1922a):

> The Cache Division of this Forest has been covered by intensive grazing reconnaissance. The acreages of the different types as shown by this reconnaissance are:

Type	Surface Acres	Forage Acres
open grassland	4,987	1,867
meadow	1,234	679
open weed	7,153	3,150
sagebrush	118,630	35,539
browse	70,973	24,208
conifer	222,566	65,132
waste	9,164	249
barren	4,512	0
woodland	15,282	2,811
aspen	106,353	50,280
Total	560,854	183,915

With the exception of the land classed as barren, all the other types are suited to grazing. In general, the open grassland type is composed of about 50% grasses, 25% weeds and 25% browse. The principal species occurring in each of these groups are as follows: grasses - blue, wheat, brome, needle, trisetum and cheat; weeds - yarrow, balsamroot, beard tongue [*Penstemon*], indian paint brush, wild carrot, groundsel and eriogonum; browse - sagebrush, serviceberry, snowberry, mountain maple and chaparral.

The meadow type is small in area, but produces a comparatively large amount of forage. Its principal plants are blue grass, alpine timothy, sedges, clover, yarrow, plantain, groundsel, elephant weed, marsh marigold, buttercup, five finger, dandelion and false hellebore [*Veratrum*]. Approximately 75% of the forage is composed of grasses and grass-like plants, and 25% are weeds.

The open weed type is composed of 60% weeds, 25% grasses and 15% shrubs. The more important species in each group are: grass - wheat, needle, brome, trisetum, onion; sedges; weeds - green dock, tall larkspur, groundsel, yarrow, balsamroot, cleft-leaf dock, geranium, five finger, lupine and niggerhead [*Rudbeckia occidentalis*, Western coneflower]; browse - sagebrush, snowberrry, serviceberry, mountain maple and elderberry.

The sagebrush type is composed of the following species: grasses - bluebunch, mountain june [*Koeleria macrantha*], wheat, blue, brome, cheat, needle [*Stipa* spp.] and trisetum; sedges - several; weeds - geranium, lupine, meadow rue, yarrow, indian paint brush, groundsel [*Senecio* spp.], balsamroot, eriogonum, sego lily, yellow umbel, mustards, beard tongue, five finger, carrot and aster; browse - sagebrush, chokecherry, snowberry, yellow brush, rabbitbrush [*Chrysothamnus*], serviceberry, buffalo berry and currant. About 50% of the vegetation is shrubs, 25% grasses and 25% weeds.

Areas upon which browse species predominate are also important as range. The principal browse plants are aspen, chaparral, snowberry, sagebrush, chokecherry, serviceberry, mountain maple, mountain mahogany, buffalo berry, Oregon grape, and rabbitbrush; weeds are lupine, yarrow, groundsel, geranium, meadow rue, green dock, balsamroot, aster, wild carrot, indian paint brush, daisy, sego lily and eriogonum; the grasses are fescue, wheat, brome, pine, rye, blue and mountain june. Fifty-five percent of the browse type is browse, 25% weeds and 20% grasses.

The conifer timber type has vegetation made up of 50% weeds, 20% grasses and 30% shrubs. The more important weeds are geranium, meadow rue, buttercup, lupine, yarrow, niggerhead, indian paint brush, balsamroot, small sunflower, elk weed, skunk weed, eriogonum and fireweed; the grasses are wheat [*Agropyron* spp.], brome, bluebunch, porcupine, fescue, and mountain june; the browse species are snowberry, sagebrush, chaparral, elderberry, mountain mahogany, Oregon grape, mountain ash, chokecherry, serviceberry and yellow brush.

The waste range comprises areas with Douglas-fir supporting no forage plants; dense timber where arnica and small chaparral grow; timber so dense that grasses and weeds are excluded and fallen timber makes it inaccessible; and areas inaccessible due to the dense brush or steep slopes of rough surface.

The barren type occurs on cliffs and other very rocky areas which are almost void of vegetation.

Mountain mahogany and juniper characterize the woodland type. The following weeds make up approximately 30% of the stand: balsamroot, beard tongue, indian paint brush, phacelia, geranium, groundsel, wall flower, mustard, and eriogonum. The following grasses make up 30% of the vegetation: wheat, blue, rye, fescue, brome and needle. The following browse species make up 40% of the vegetation: mountain mahogany, sagebrush, serviceberry, snowberry, mountain maple, and Oregon grape.

Under aspen, the vegetation is 40% shrub, 30% grass, and 30% weed. The more important browse species are: snowberry, chokecherry, aspen, serviceberry, chaparral, willow and sagebrush; grasses are: brome, bluebunch, wheat, blue, trisetum, needle and onion; the weeds are: aster, meadow rue, fireweed, arnica, geranium, five finger, pea vine [*Lathyrus* spp.], dandelion, beard tongue, yarrow, sunflower, green dock, and skunkweed.

Table 9—Number of acres by cover type for 14 range allotments on the Caribou National Forest 1922. Range allotted to the grazing of cattle comprise 185,336 acres. The areas, types, and forage of the allotments are shown in the table (Forest Service 1922b).

Allotment	Grass		Weed		Sage		Browse		Conifer		Woodland		Aspen		Barren		Total acres	
	SA	FA	SA	FA	SA	FA	SA	FA	SA	FA	SA	FA	SA	FA	SA	FA	SA	FA
Snake River	1,181	698	5	3	2,833	1,079	588	191	1,084	315			5,247	2,455	130		13,348	5,697
Fall Creek	1,956	1,187	264	171	4,527	1,912	218	149	348	99			1,176	507			10,519	4,985
Caribou Basin	50	13			3,443	1,635	25	17	88	34			548	290			9,803	4,398
Bridge Creek	1,259	522	634	357	1,023	500	20	13	607	222			2,726	1,202			8,686	3,879
Rasmussen Valley	115	79			2,136	1,078							289	118			4,379	2,027
McCoy Creek																	1,761	866
Tin Cup	112	62	87	48	4,700	2,398	629	519	3,012	1,035			6,610	3,312			17,447	8,215
Lanes Creek																	2,681	856
Stump Creek			409	239	3,591	1,644	145	75	2,331	604			3,331	1,733			12,476	3,350
Sage Valley					1,205	441							275	105			1,480	546
Diamond Creek																	3,799	1,438
Dry Valley	1,132	578	146	81	11,430	4,783	84	51	1,755	564			11,374	4,980	102		34,394	13,820
Maple Canyon	322	152	469	248	1,739	636	407	169	631	198			948	499	267		5,291	2,126
Mont. Elk Valley	4,251	1,793	1,815	905	25,770	9,158	5,031	2,225	5,361	1,630	147	35	13,018	5,855	204		59,272	23,072
Total acres	10,378	5,084	3,829	2,052	62,393	25,264	7,147	3,209	15,217	4,699	147	35	45,542	21,056	703		185,336	77,275

SA = surface acres, FA = forage acres.

In 1922, a Range Classification Report was written for the Caribou National Forest. The following excerpts and table 9 are taken from the report (Forest Service 1922b):

The principal forage plants in the sage-grass type are:

20% weeds		40% grasses		40% shrubs	
yarrow	3%	blue grass	12%	sagebrush	25%
geranium	7%	fescue	10%	rabbitbrush	5%
lupine	5%	slender wheat	3%	serviceberry	2%
daisy	2%	brome grass	3%	snowberry	5%
docks	2%	awned wheat grass	12%	aspen	2%
yampa	1%			Purshia	1%

The principal forage plants in the weed type are:

60% weeds*		25% grasses		15% shrubs	
white dock	\	wheat grass	15%	sagebrush	10%
green dock	50%	needle grass	5%	buckbrush	2%
cleft-leaf dock	/	blue grass	5%	rabbitbrush	3%
small sunflower	8%				
annuals	2%				

* white dock may refer to *Wyethia helianthoides*, if a cleft-leaf dock then may be *Balsamorhiza hookeri* or *B. macrophylla*; green dock is either *Rumex acetosella, R. conglomeratus*, or possibly *Wyethia amplexicaulis*; small sunflower could be either *Helianthella microcephala* or *Helianthusanuus*.

The principal forage plants in the grass type are:

30% weeds		40% grasses		30% shrubs	
white dock	15%	wheat grass	25%	sagebrush	20%
lupine	5%	blue grass	8%	rabbitbrush	5%
cleft dock	2%	fescue	5%	serviceberry	1%
small sunflower	2%	tall rye grass	2%	Purshia	2%
snap dragon	2%			snowberry	2%
mustards	1%				
indian tobacco	1%				
tin piute	1%				
stone crop	\				
carrot weed	1%				
indian paint brush	/				

The principal forage plants in the aspen type are:

35% weeds		35% grasses		30% shrubs	
geranium	12%	brome grass	12%	snowberry	5%
lupine	8%	blue grass	8%	sagebrush	8%
horsemint	2%	wheat grass	5%	small chaparral	5%
senicio	2%	pinegrass	10%	chokecherry	2%
arnica	2%			aspen	5%
fireweed	2%			rose	1%
yarrow	2%			elderberry	1%
mustard	1%			serviceberry	2%
sweet cicely	1%			Oregon grape	1%
asters	1%				
meadow rue	1%				
docks	1%				

The principal forage plants in the browse type are:

20% weeds		30% grasses		50% shrubs	
sage	3%	wire grass*	10%	willow	40%
dandelion	3%	sedges	10%	cinquefoil	2%
yarrow	2%	blue grass	4%	currant	3%
strawberry	2%	needle grass	4%	sagebrush	5%
clover	1%	brome grass	1%		
mustard	1%	wheat grass	1%		
violet	1%				
geranium	3%				
false solomon seal	1%				
cow cabbage*	2%				
thistle	1%				

* cow cabbage is *Veratrum* spp.; wire grass is *Juncus* spp.

The principal forage plants in the conifer type are:

25% weeds		50% grasses		25% shrubs	
geranium	10%	pinegrass	30%	aspen	5%
Arnica	5%	brome grass	8%	snowberry	5%
tall paint brush	2%	wheat grass	6%	serviceberry	3%
lupine	5%	blue grass	6%	small chaparral	10%
tall aster	1%	willow 2%			
fireweed	2%				

Observations of the cattle range and comparisons between old and new write-ups indicate there has been a gradual change from grasses to weeds, and an increase in unpalatable forage plants. A considerable area of the cattle range is composed of aspen types stocked with forage plants which will not stand up under heavy and repeated early grazing. The condition of the range clearly shows that it is overstocked, and is resulting in the deterioration of more valuable forage plants. Pinegrass is the highest percentage of grass over the whole forest (Phinney 1929).

The season of use varies from April 16 to October 30 on the lower range along the Snake River, to June 1 to October 15 on the high ranges, such as Diamond Creek and Caribou Basin. The season most used is one beginning about May 5 and closing October 20. It is probable that for all ranges opening before June 1 the season is slightly earlier than the range should be used to secure the most benefit of the forage. Seasons beginning ten days to two weeks later on these ranges would probably be better.

Fires—Gilbert L. Farr gave a talk to the Bannock County History Society in 1968 about many topics, one of which reviewed specific fires on the Forest.

The first record of fire on or near the Caribou was made by Robert Stuart in 1812. He mentioned a recent fire in the area between Fish Creek Divide and Alexander Gap had destroyed all the horsefeed. The pioneer settlers reported that forest fires

during the 1870's and as late as 1888 burned uncontrolled all summer long in the area that is now the Caribou NF. The even-aged stands of lodgepole pine indicate that whole forests were destroyed by fire from 1855 to 1890. A news item in the Pocatello Tribune in 1901 states "A big timber fire is burning on the mountains east (Portneuf Division) and south of Pocatello (Pocatello Division). It seems to have started in Portneuf Canyon yesterday morning and during the afternoon burned up over the mountains on the south side of the canyon. Sometime during the day, the fire crossed the canyon and burned up Rapid Creek. All afternoon great clouds of smoke rolled up from the range just east of the city. Last night the fire burned down over the side of the mountains that face the city (Black Rock Hills) and a great ring of fire blazed fiercely in plain view all night. The fires are still burning both up Rapid Creek and south of the canyon and this morning it is reported that fire is working up Mink Creek."

In 1917 or 1918 another fire swept over the hill from the farmlands in Arbon Valley and burned down Mink Creek nearly all the way to Inkom (Farr 1968).

Fires in Paris Canyon during the 1880's burned continuously all summer. In 1905 or a few years earlier, a sudden fire burned over the area adjacent to the earlier burn. A major fire burned in Bloomington Canyon in 1934 (Anonymous, n.d.a.).

Fire History—In 1994, Barrett conducted a cursory forest-wide fire history study. The goal was to determine fire regime patterns for the major forest types to supplement the Forest Plan revision and to assist the development of strategies for ecosystem management. He specifically collected data to determine presettlement fire patterns and interpret the possible effects of fire suppression on area forests. Sampling focused primarily on Douglas-fir- and aspen-dominated stands. Most scarred trees had one or two fire scars; many were seam scars. Intensive searches also produced a number of remnant old trees that had three to six scars. One Douglas-fir (600+ years old) had at least 14 scars (Barrett 1994a).

Data from scars and seral age classes indicated that past fires played a critical role. Many stands contain two or three fire-initiated seral age classes, indicating they were fire maintained until shortly after European settlement in the late 1800's. Most stands are multi-aged (seral component), evidence of a mixed-severity fire regime. Few trees are over 250 years, even on relatively productive sites. Non-lethal fire regimes occurred on dry, sparsely forested sites. Most mature Douglas-firs failed to scar even after repeated underburns (Barrett 1994a).

At least 53 fire years occurred between 1269 and 1967, yielding an area mean fire interval of 6 to 13 years. There were seven major fire years between 1745 and 1934 (mean fire interval of 32 years between major events). A short to moderately long interval mixed-severity fire regime was predominant in this area. (Mixed severity refers to fires that can produce the full range of severities, from non-lethal to total stand replacement, both during a single fire event and between consecutive events.) Most fires were patchy and only rarely burned extensive areas (Barrett 1994a).

The cool, dry Douglas-fir habitat types (Fire Group 2) had a mean fire return interval of 13 to 23 years. The moist Douglas-fir habitat types (Fire Groups 3 and 4) had a mean fire interval of 16 to 66 years. The lower to mid subalpine habitat types had a mean fire interval of 29 to 97 years (Barrett 1994a).

Long-term grazing and fire suppression have precluded as many as three or four fire events in many stands over the past 100 years. As many as 9 or

10 fire cycles may have been preempted in the driest ecosystems. Relatively widespread decadence is visible in many older stands, and a major outbreak of Douglas-fir beetle occurred in recent years. Fire exclusion has allowed an increase in live and dead fuels at both the stand and landscape level. At the broad scale, an overall decrease in spreading fires during this century has encouraged a more uniform aging of vegetation mosaics, thus a widespread increase in mosaic homogeneity (Barrett 1994a).

Challis National Forest

Table 10 contains a summary of the acres for each timber type in the Boise Working Circle during the 1950's.

Table 10—Number of acres by size class and cover type for the Challis National Forest (Boise Working Circle) in the 1950's.

Timber type	Acres
PP large sawtimber	399,605
PP small sawtimber	11,568
PP cutover	117,380
PP poles and saplings	13,281
Total PP	541,834
DF large sawtimber	206,854
DF small sawtimber	156,429
DF cutover	17,255
DF poles and saplings	45,329
Total DF	425,867
Spruce large sawtimber	21,726
Spruce small sawtimber	23,792
Spruce cutover	491
Spruce poles and saplings	60
Total spruce	46,069
AF large sawtimber	5,051
AF small sawtimber	58,550
AF cutover	260
AF poles and saplings	5,539
Total AF	69,400
WF large sawtimber	4,660
WF small sawtimber	1,799
WF cutover	6,387
WF poles and saplings	382
Total WF	13,228
LP small sawtimber	60,062
LP cutover	1,603
LP poles and saplings	101,673
Total LP	163,338
Subtotal	1,259,736
Deforested	92,450
Total commercial	1,352,186

Grazing—Grazing began in the Weiser River Valley in the 1860's. Settlements were established along the river corridor and gradually spread to adjacent valleys. By the 1870's, the cattle industry along the Weiser River was well established. Before the arrival of sheep, cattle grazed at the lower elevations. Sheep were brought into the Council Mountain and West Mountain areas around 1890 (Jones 1989), forcing cows onto higher elevation ranges and depleting wheatgrass. Cows and sheep competed heavily for the best summer range in the mountains.

Small bars along the Little Salmon and main Salmon were settled by cattlemen because they could easily winter their cows at the lower elevations. In 1888, there were 67 ranches in the Little Salmon country. Sheep were brought into the Goose Lake area in 1895. Prior to that time, no stock had been grazed there or in the region north to the Salmon River (Jones 1989).

E.N. Wiggins came to Midvale, ID, when he was five years old, in 1877. He later classified the vegetation on the range as a bunchgrass type mixed with bluegrass and fescue. He thought that much of the range that had originally supported bunchgrass had changed by 1900 to support cheatgrass and other annuals. The depletion of the range started before or about the time the forest was put under Federal administration and continued for several years. The depletion was caused in part by grazing stock too early in the spring (Wiggins n.d.).

J.M. Stover was 18 when he arrived in Weiser, ID. At that time the range was in "excellent condition." Bunchgrass was the principal grass type and was mixed with bluegrass and fescue. The bunchgrass, bluegrass, and fescues slowly disappeared and were replaced by cheatgrass (Stover n.d.).

Timber—In 1907-08, the **Mann Creek watershed** was surveyed by Clinton G. Smith. This watershed occupies portions of T. 14 and 15 N., R. 6 W. (surveyed) and T. 14 and 15 N., R. 5 W. (unsurveyed). Portions of Smith's (1908) report follow:

Yellow Pine Type

Yellow pine is the most important commercial tree, it yields ⅔ of the merchantable timber on the tract and occurs on all slopes and exposures except steep north and east slopes and side hills. Its average maximum diameter is 32 inches and a height up to 90 to 110 feet. Yellow pine forms a distinct forest type with a characteristic open stand, and a yield of from 5 to 20,000 bd ft per acre, the latter usually limited to an acre or two. The ground cover is usually grass with but little litter or down timber. The reproduction of pine by seed in virgin forest is meager. Abundant seeding without damage by fire or trampling by stock seems to be the condition that contributes most to this reproduction. There has been little damage by beetles in this watershed; about 6 trees only were seen so affected, these were along Bear Creek.

Red Fir Type

It often forms pure dense stands on north and east exposures. In the higher altitudes, it gives way to white fir and tamarack. Its average maximum size is 24 inches and a height of 100 feet. An area culled for fence posts leaves a very poor and undesirable stand of scrubby, misformed trees of little commercial value. This condition prevails on Rock Creek, Monroe Creek, portions of Adams Creek, Iron Mountain and Hitt Creek. On the latter creek, a burn of 80 acres has followed cutting and on 25 acres. It was so severe as to kill seed trees, and but little reproduction occurs.

White Fir Type

This type forms extensive stands of open forest in the higher altitudes of this region. It is a short lived tree, and is damaged by fire and wind. It is important that this tree be given all protection possible against fire, and in overgrazing where reproduction is occurring, as by virtue of its position it must exert considerable influence in conservation of the water supply.

Tamarack Type

It is found on upper Bear Creek and Fourth of July Creek. It forms almost pure stands in flats. Is small in size, rarely over 18 inches in diameter. White fir and red fir also occur in mixture with this type.

Other trees found on the tract but having no commercial value are: lodgepole pine, cedar and quaking aspen. Shrubs are found as follows: vine maple, Oregon grape, salal [*Gaultheria shallon*], wild cherry, chokecherry, gooseberry, wild rose (several species), willow (several species), syringa, spice bush [*Kalmia microphylla*, mountain laurel] and sage.

In 1908, Walter A. Hopson surveyed the West Pine Creek watershed. Portions of his report follow:

Yellow Pine Type

The great commercial tree of this forest is the yellow pine and it is regretted that its reproduction is so slow and so very unsatisfactory. Red fir, white fir, and tamarack are the other species growing to any extent on this watershed. This tree occurs on the slopes and bottoms of all the creeks. On the north and east slopes the trees are short and stunted and branchy. The bottom lands or bottoms of the slopes, contain the best growth of pine and we find areas containing at least 10 to 25,000 bd ft to the acre. Other areas only produce 5 to 7,000 bd ft per acre. The stand in this entire region is mature. In a good stand the average maximum diameter is 30 to 36 inches and has a merchantable bole of 90 to 110 feet. The stands of yellow pine are distinct from the other species found on this area. They are of an open character with very little underbrush and usually a good covering of grass called by the people in this vicinity, pine grass. An occasional old fallen tree is to be found with here and there scattering dead branches which have broken off during a storm. Where the pine is in mixture with the firs and tamarack we find plenty of down timber. Areas of this sort are found more frequently than those of distinct species so over the entire tract there is an abundance of down timber of all species of trees. In the stands of pine we find but very little reproduction and only in spots or open parts do we find satisfactory reproduction.

On Blue Springs Creek a few insect infested trees were found. Perhaps 50 trees in all were so infested and of these 25 were dead and the remainder will be dead within the year. It has been noticed in this vicinity that the trees most affected were from 10 to 15 inches in diameter. Beetles were found in all suspected trees. Insects very seldom attack the larger trees.

Red Fir Type

This tree is found generally over the entire area, and forms patches of pure stands on the higher slopes of north and eastern exposures. It is found on the slopes in mixture with the pine and white fir or on the higher slopes in mixture with tamarack and an occasional white fir. It never grows to a great size as an average tree, and as an average its diameter is 26 inches with a merchantable height of 90 to 100 feet.

White Fir Type

This prevails throughout the entire area and is usually found on northern exposures, or on the higher slopes in mixture with red fir and tamarack. Of the greater portion of downed timber and standing dead timber, white fir forms fully 50% of the whole, tamarack ranking next with about 30% on the higher slopes.

Tamarack Type

This tree forms fairly dense stands only on the higher slopes of a north and eastern exposure. It is found to some extent on the headwaters of the south forks of West Pine Creek and it reaches a diameter of 18 to 24 inches with a height of 90 feet.

Along the creek bottoms we find dense growths of other species of trees. They are the aspen, vine maple, alder, dogwood, wild cherry, and several species of willows. Among these are found growing wild roses (several species), gooseberries, and wild currants. On the higher ridges we find chaparral and serviceberry in mixture with sagebrush.

In 1908, Walter A. Hopson also examined T. 18 N., R. 1 E., and 1 W. in the Weiser River Watershed. Portions of Hopson's (1908) report follow:

Burns

Some 23 years ago, a fire of a very devastating nature ran over about 200 acres of timbered land about ½ mile south of Evergreen. For the greater part, the timber was entirely burned off. What few trees remained were so badly injured that they afterward died. The seed trees on the border of this burn have done wonderful work in restocking this area. On all of the larger and smaller burns in this vicinity, it seems that the chaparral and thorn and arrow wood came up first and covered the soil; then the young pine and red fir seedlings were started and protected until now they are growing above the tops of the bushes and it will smother out the bushes and have full control of the soil. This condition for seedling growth is ideal in this section of the country and where there is a good young growth, it is coming on under these same conditions. Throughout this region there is no cause to fear that the trees will not restock themselves. Observations have shown that seedlings are growing where no trees ever grew before, and with protection from fire and grazing of sheep, these areas will contain an excellent stand of timber.

Yellow Pine Type

Pure stands of yellow pine, with occasional red fir, are found over parts of this area, but in general pine is found in mixture with red fir, tamarack and white fir, and forms fully 50% of the timber on this watershed. Commercially the most accessible stands are along the lower slopes of the bottom lands of the creeks, and reach nearly to the top of the ridges. On the higher elevations the pine gives way to red fir. The average maximum diameter for a tree of this region is 30-40 inches. In an open stand of yellow pine where there is a slight mixture of fir, there is very little underbrush and pine grass is found in abundance. On these areas, there is an entire lack of young growth. Pine seedlings will not grow in dense shade. Numerous seedlings were found 3 to 4 years old but they were sickly and will soon die. Red fir is more tolerant and is under planting the pine in many localities. If this condition continues, the stands that are now chiefly composed of yellow pine will in the future be red fir stands of good quantity and quality.

On burned and cut-over areas where there is plenty of light, pine is coming in with excellent results. Small patches were found which were literally thickets of yellow pine. These seedlings grow best on a mineral soil. Where nearly pure stands of pine are found, there is practically no dead, fallen timber, very few limbs or debris litter on the ground. One might drive between the trees with but little hindrance. Mixed stands contain an almost inestimable amount of fallen timber. Great logs lie piled one on another. Winds and fires have fallen the majority although trees will fall from old age.

Red Fir Type

Red fir extends to the top of the ridge and it is on these trees that we find the greatest amount of seed. This tree has seed years more frequent than the pine and is in many places understocking pure stands of yellow pine. Frequently trees were found 36 inches in diameter with a merchantable bole of 90-100 feet. Very few red fir were observed that were fire scarred.

Red fir is gaining control of more ground than is the yellow pine on this watershed. More seedlings of this tree are found per acre and the only reasons for this gain are the tolerance of the red fir and its frequent seed years. Apparently the red fir seeds abundantly every two years. This gives it an advantage over the yellow pine whose seed years are from four to seven years apart.

White Fir Type

This species is found principally on the northern exposures of the smaller streams and along the timbered flats and bottoms of the river. More dead fallen timber is found in stands of white fir than in any other place on the Forest.

Tamarack Type

It is found growing along the creek bottoms and not infrequently on some of the lower slopes. This tree attains a fair height and size. The reproduction of this tree is fair although it does not do well in shaded areas. We can hardly classify this tree as a promising tree for this Forest.

Engelmann Spruce Type

This tree is found scattered along creek bottoms. It reproduces well and is quite tolerant. An occasional tree is large enough to be cut for saw timber.

Later, in 1912, A.E. Oman surveyed a portion of the East Fork of the Weiser River for a proposed timber sale. The survey included portions of T. 18 N., R. 1 W. Sections 8, 17, 18, and 20. Oman's (1912) comments follow:

Character and Condition of Forest

Yellow pine constitutes approximately 83% of the merchantable stand. The best individual trees are found scattered singly and in groups on the small flats along the river. There is excellent advanced reproduction of pine in groups and belts through openings in the virgin stand. There are belts of good Douglas-fir reproduction, especially at the base of the slope on the west side. Dense pine grass cover is common on the upper steep slopes, or the cover, especially in small openings in pine stands, is dense nine-bark. Open chaparral growth of willow and ceanothus prevails along the bare slopes. This is the type of cover under which the best reproduction is found. There are quite extensive bodies of pole stands, of the "Bull pine" type, interspersed with the mature pine, particularly on the east side of the river just below the forks. There are scattered small groups of old beetle-killed pines; some in the pole stands and some among the larger trees. There has been very little beetle injury in recent years. Evidence of past fires are apparent throughout the area. Occasional virgin pines are quite deeply scarred but in general the pine is only slightly damaged. Douglas-fir, on the other hand, is considerably damaged.

In 1912, the Upper Weiser River watershed was surveyed (the major portion of the east half of T. 20 N., R. 1 W. Sections 1-3, 10-15, 21-28, 33-35 and 35 in T. 21 N.). This report basically described the same species composition found in 1908. One difference was the presence of lodgepole pine in fringes or patches of pine stands along the two small streams in the watershed. In some cases it radiated up the slopes in mixture with yellow pine (Forest Service n.d.).

The forest was uneven-aged, with a large proportion of large mature trees, and a relatively small proportion of pole-size trees. Much of the pine type area had only a small number of seedlings and saplings. For example, in Sections 34 and 35 the average stand per acre had 88 seedlings (under 5 ft), 98 saplings (5 to 15 feet), four small poles (15 ft, 6 inch dbh), two large poles (6-14 inch dbh), one tree 14-16 inch dbh, and seven trees above 16 inches dbh (Forest Service n.d.).

On the north end of the watershed, where yellow pine was scattered, there were some "exceptionally tall fine trees of large diameter indicating that as a result of recurring fires and other causes, the competing firs have usurped the ground." Larch grew in groups with pine on the lower slopes and basin areas. On the lower rolling slopes and ridges, the pine stand was very open, with pinegrass growing underneath. On higher sites and on high steep slopes there was a dense growth of ceanothus and willow. Spirea, mountain ash, maple, black current, honeysuckle, and fire berry [*Vaccinium scoparium*, whortleberry] were common shrubs. (Forest Service n.d.)

Due to the decadent (trees 30-40 inches dbh were common) white fir, and fire-killed timber, there was an abundance of dead and down timber throughout the mixed conifer type. The reproduction was scarce, with white fir numbering less than 200 seedlings per acre. (Forest Service n.d.)

Average Stand Per Acre - Yellow Pine Type

	Number of Trees					
Tree size	Y. Pine	D. Fir	W. Fir	Larch	Misc.	Dead
Seedlings	88	80	79	11	43	
5′ to 15′	9	27	11	3	7	
15′ to 6″	4	9	5	2	2	
6″ to 14″	2	3	2	1	1	
14″ to 16″	1	0	0	0	0	
16″ +	7	5	2	1	1	1

Total number of trees 16″ and over - 16

Average Stand Per Acre - Mixed Fir Type

	Number of Trees					
Tree size	Y. Pine	D. Fir	W. Fir	Larch	Misc.	Dead
Seedlings	18	25	143	13	13	
5′ to 15′	3	8	17	1	3	
15′ to 6″	1	7	10	1	1	
6″ to 14″	1	4	4	1	1	
14″ to 16″	0	0	0	0	0	
16″ +	3	7	7	2	1	3

Total number of trees 16″ and over - 20

A.E. Oman (1909) examined a tract of land on lower **Indian Creek watershed**. Sections 18, 19, 20, 29, 30, 31, and 32, T. 20 N., R. 3 W. were surveyed and portions of his report follow:

Reproduction and Character and Condition of Forest

There is very little young seedling growth on this tract. There is a sparse stand of small pine seedlings along the divide. On the lower creek slopes, the stands of timber are young, or are uneven-aged. In these stands are many small areas of sapling Douglas-fir, and scattering reproduction of fir and pine.

Yellow pine predominated. It occurs in nearly pure stands on the rolling land along the main divide, and on the Indian Creek slopes. Douglas-fir is the prevailing species on the steep north slopes along the lower courses of the tributaries. Associated with the fir are yellow pine and, in the district north of Boulder Creek, a small proportion of white fir and larch. White fir is most abundant along Camp Creek. The merchantable pine stands are approximately even-aged and the timber is mature. Dead timber occurs throughout the tract, but not in large quantities.

Character of Land:

Timbered area	3,325
Barren or grassland	3,077
Total	6,402 acres

Proportion of Species:

	Percent of Merch. Timber
Yellow pine	87
Douglas-fir	10
White fir	2
Larch	1

A portion of the **Goose Creek watershed** was surveyed in the spring of 1912 by H. C. Williams. The area surveyed included the lower, and mostly timbered portion of the watershed. Reproduction in the yellow pine type was patchy with seedlings occurring in groups of even-age classes. Repeated fires in the past scarred about 40 percent of the yellow pine trees. The ground cover in this type is huckleberry, pinegrass, ninebark, ceanothus, patches of willow, and scattered cherry (Williams 1912). Tables 11-14 summarize the number of trees per acre by cover type for the Goose Creek logging chance, as recorded by Williams (1912).

The mixed conifer type (including subalpine fir, Engelmann spruce, Douglas-fir, and larch) was composed of young uneven-aged trees scattered more uniformly over the tract. The ground cover was pinegrass, huckleberry, ceanothus, and clusters of willow.

Table 11—Number of trees per acre (based on 28 acres) in the yellow pine type for the Payette National Forest in 1912.

Tree classes	Yellow pine	Douglas-fir	Larch	Balsam	Lodgepole pine	Total
Seedlings	95.31	29.83	0.50	22.30	6.20	154.14
Saplings (to 5" d.b.h.)	58.70	34.91	0.20	33.10	0.02	126.93
D.b.h. 6"	3.00	1.26		1.20	0.02	5.48
8"	1.00	0.80		0.50		2.30
10"	0.30	0.57		1.00		1.87
12"	0.51	0.34				0.85
14"		0.54		0.18		0.72
16"		0.12		0.07		0.19
18"	1.43	0.54	0.04	0.18		2.19
20"	0.96	0.50	0.04	0.07		1.57
22"	0.34	0.39		0.18		0.91
24"	0.54	0.07		0.10		0.71
26"	1.86	0.21		0.07		2.14
28"	0.86	0.18		0.07		1.11
30"	1.25	0.07				1.32
32"	1.25	0.11				1.36
34"	0.71	0.04				0.75
36"	0.41			0.04		0.45
38"	0.32	0.04				0.36
40"	0.04	0.04				0.08
42"	0.07					0.07
44"						
46"	0.04					0.04
48"						
50"						
52"						
54"						
Grand total	168.90	70.58	0.78	59.06	6.24	305.54

Table 12—Number of trees per acre (based on 32 acres) in the mixed fir type for the Payette National Forest in 1912.

Tree classes	Yellow pine	Douglas-fir	Lodgepole pine	Larch	Balsam	Spruce	Total
Seedlings (<5')	20.74	31.95	14.50	2.03	35.84	9.16	114.22
Saplings (to 5" d.b.h.)	7.07	21.26	8.93	0.98	19.77	3.95	61.96
D.b.h. 6"	0.90	3.40	1.13	0.19	2.28	0.47	8.37
8"	0.38	2.76	0.01	0.46	0.93	0.37	4.91
10"	0.43	1.49		0.79	0.37	0.42	3.50
12"	0.43	1.16		0.37	0.16	0.09	2.21
14"	0.30	0.72		0.06	2.03	0.25	3.36
16"	0.20	1.38		0.25	2.63	0.69	6.12
18"	0.25	1.53		0.31	1.87	0.78	4.74
20"	0.14	1.44		0.28	2.16	0.47	4.49
22"	0.14	1.19		0.16	1.72	0.41	3.62
24"	0.22	0.56		0.16	1.19	0.22	2.35
26"	0.28	0.31		0.06	0.96	0.15	1.77
28"	0.14	0.25		0.06	0.44	0.06	0.95
30"	0.06	0.19		0.03	0.16		0.44
32"	0.19	0.12			0.13	0.06	0.50
34"	0.14	0.10			0.09		0.33
36"	0.10	0.03			0.06		0.19
38"	0.14	0.03			0.06		0.23
40"	0.03						0.03
42"	0.06						0.06
44"	0.10						0.10
46"	0.03						0.03
48"	0.06						0.06
50"	0.03						0.03
Grand total	32.56	69.87	25.54	6.19	72.85	17.56	224.57

Table 13—Number of trees per acre (based on 9 acres) in the lodgepole pine type for the Payette National Forest in 1912.

Tree classes	Lodgepole pine	Douglas-fir	Larch	Yellow pine	Balsam	Spruce	Total
Seedlings (<5')	164.00	9.20	1.00	14.50	12.60	3.33	204.63
Saplings (to 5" d.b.h.)	101.40	6.20		8.93	8.40	0.89	125.82
D.b.h. 6"	26.00	1.20		1.13	1.60	0.67	30.60
8"	8.40			0.01	0.60		9.01
10"	***	0.40			0.60	0.45	1.45
12"		0.20			0.10	0.24	0.54
14"							
16"	44.10						
Grand total	299.80	17.20	1.00	24.57	23.90	5.58	372.05

***Ties per acre for trees 10" d.b.h. and over.

Table 14—Number of trees per acre (based on 14 acres) in the subalpine-spruce types for the Payette National Forest in 1912.

Tree classes	Douglas-fir	Larch	Balsam	Spruce	Total
Seedlings (<5')	17.90	2.20	113.18	42.30	175.58
Saplings (to 5" d.b.h.)	14.90	1.00	79.18	10.00	105.08
D.b.h. 6"	3.10	0.60	4.71	2.30	10.71
8"	2.10	0.10	3.18	2.50	7.88
10"	0.70	0.10	2.71	1.10	4.61
12"	0.10	0.20	1.88	1.30	3.48
14"	0.14		5.64	2.29	8.07
16"	0.36		5.86	2.64	8.86
18"	0.57		3.79	1.07	5.43
20"	0.14		2.29	0.71	3.14
22"	0.43		2.00	0.29	2.72
24"	0.21		1.29	0.36	1.86
26"	0.21		1.07	0.14	1.42
28"	0.29		1.07		1.36
30"	0.07		0.71		0.78
32"			0.29		0.29
34"			0.36		0.36
36"			0.14		0.14
38"					
40"			0.14		0.14
42"			0.07		0.07
44"			0.29		0.29
46"			0.29		0.29
Grand total	41.22	4.20	230.14	67.00	342.56

Williams (1912) classified the watershed by type in the following categories:

Yellow pine (3,208 acres)
Mixed fir (7,613 acres)
Lodgepole pine (560 acres)
Engelmann spruce (1,526 acres)
Burns (802 acres)
Grass (334 acres)

Idaho National Forest—In 1909, H.A. Bergh wrote very brief descriptions of the timber while he surveyed all five Districts on the Forest for possible logging opportunities. Portions of Bergh's (1909) report follow:

Payette River Watershed

All of the area sloping directly into the Payette River is very brushy (mountain laurel, huckleberry, and willow). There are numerous treeless areas covered with impenetrable masses of laurel and willow. The area is composed primarily of Douglas-fir, Engelmann spruce, lodgepole pine and a small percentage of larch, white fir and yellow pine. There have been numerous small fires, started mostly by sheep herders.

Goose Creek Watershed

The ground cover is grass, tree needles, and leaves. The treeless areas are covered with mountain laurel and chaparral. The reproduction is above average. The yellow pine is mostly in the sapling stage. Other species have good reproduction of all ages. Tree species present include primarily yellow pine and tamarack with small amounts of white fir and Douglas-fir.

Meadows Valley Watershed

Ground cover is grass and weeds. Mountain laurel is found in considerable quantities, but is confined to the treeless areas. The reproduction is somewhat above average especially in areas with yellow pine. Other species have average reproduction. The yellow pine is open, while the other species have dense thickets and numerous small open parks peculiar to their species.

Little Salmon River Watershed

No ground cover except a thin coating of mountain grass. The absence of underbrush is most noticeable. A large part of this area is covered with fallen trees. The causes are equally divided between fires and old age. Reproduction is very good except where sheep have overgrazed. There is a great deal of open ground, in fact about half of the area would be considered treeless, except a few scattered clumps of spruce and white fir and, in some cases, notably the higher ridges, scattered pinyon pine.

French Creek Watershed

Reproduction is good and consists mainly of seedlings and small saplings. Portions not burned have an exceedingly dense and prolific growth of spruce, white fir, and lodgepole with spruce as the predominant species. Almost the entire area has been burned, leaving only a few widely scattered tracts of green standing timber. Great bodies of standing, down and partly burned logs are witness to the fact that this area once supported an immense body of timber, consisting of spruce and lodgepole. This watershed has been burned and reburned by sheepmen to make open grazing for sheep. The small bodies of timber still standing have an almost impenetrable mass of low underbrush.

Lake Creek Watershed

The forest is mature with very little of the younger growth. Lodgepole is the predominate species and forms almost 90% of the total stand. There is no brush nor humus. This tract is open, except for small areas that are covered with down logs. A very small percent of the area has been burned.

Grouse Creek Watershed

The forest is mature with a very small amount of young growth. Lodgepole is the dominant species. The largest percent of sawtimber size trees are spruce and Douglas-fir. Yellow pine grows at the lower elevations, but it comprises a small portion of the entire area.

South Fork Salmon River Watershed

The forest is mature with a fair stand of young growth. Yellow pine is the dominant species. There is also a good stand of Douglas-fir. Spruce is found in considerable quantities on the higher slopes. There is very little brush or humus. Bunchgrass is found in abundance on the lower hills, otherwise there is very little ground cover.

Five Mile Creek Watershed

A fire burned through, and the reproduction is not growing well. There are 24,956 acres of burned area and grasslands.

Middle Salmon River/Big Creek East of Crooked Creek

There is no brush, but a great deal of fallen timber in the lodgepole and spruce stands. Yellow pine is very open and free from fallen timber. Higher elevations support a very heavy forest in spruce and lodgepole. Timbered areas are broken. Considerable damage exists from fires that were common in this region before the creation of the Forest. There are 27,904 acres of barren and burned over area.

North Fork of Smith Creek/Ramey Creek/Crooked Creek

There is a fair growth of bunchgrasses, no brush, and a very small amount of fallen timber. Timbered areas are not continuous. Some southern exposures are

entirely barren of trees. In some places tree growth is very dense. Considerable damage exists from fires that took place before the creation of the Forest. There are 7,634 acres of burned over area.

Chamberlain Creek

About 70% of the area is covered by lodgepole. On the highest divides nothing is found growing except pinyon pine. Underbrush is not generally prevalent. There are many areas of open land. Approximately 25,500 acres are burned over.

Lake Fork Watershed

The forest is composed of yellow pine, Douglas-fir, larch (3% of total stand) growing in low foothills. Spruce, white fir, and lodgepole are found growing at the higher elevations. Underbrush consists of alder along the creeks, while chaparral is found on the higher points. The area has been damaged to quite an extent by fire.

Fitsum Creek Watershed

About 25% of the area has been burned, and reproduction on the burned sites is very poor. On the remaining 75%, the reproduction is good and consists of a good stand of larch, Douglas-fir, and yellow pine with a small percent of lodgepole pine. Yellow pine makes up 25% of the stand, and Douglas-fir 33%.

Loon Lake Watershed

Principal cover is lodgepole with an average diameter of 8 inches and 50 trees per acre. Near the Secesh River the cover is yellow pine, Douglas-fir and lodgepole.

Secesh River Watershed

Underbrush consists chiefly of chaparral which is found on steep rock ridges. Reproduction is good at higher elevations and becoming thinly established on the lower hills and river bottoms. A fair percent of dead standing timber and down timber found near the base of the mountains and along the river bottom. About 35% of the stand is yellow pine mixed with 30% Douglas-fir, 25% lodgepole, and 10% evenly mixed of white fir and spruce. Average diameter of lodgepole is 10 inches and there are 12 trees per acre.

Lick Creek Watershed

Principal stand is yellow pine, Douglas-fir and larch. Spruce and white fir are found in small bodies near the summit. The timber has an average diameter of 10 inches and an average height of 60-75 ft.

Jug Handle Mountain

The high ground has been burned and most of the timber was destroyed. There is a heavy growth of underbrush. The timber is 50% white fir, 25% spruce, and 25% lodgepole. At the base of the mountain there is a stand that has 80% yellow pine and 20% Douglas-fir.

West Slope of Mountain West of Divide Between McKinley Crks & Rabbit Creek

On the divide the timber is composed of white fir, spruce, and Douglas-fir. At the headwaters of Rabbit Creek is 20% Douglas-fir, 60% white fir, 20% spruce. The divide, from the Middle Fork McKinley Creek north along the divide, to the headwaters of the West Fork of McKinley Creek has been burned and there is heavy underbrush.

North Fork of Buckhorn Watershed

The ground cover throughout this whole tract except the south slope is made up of decomposed vegetation and pine needles. In some places this cover is 18 inches deep.

Timber Management Plans—Management plans were written for the working circles during the late 1920's and 30's. These plans did not contain

the graphic stand descriptions found in the timber surveys in the early 1900's. Instead, they contain more statistical information, such as stand composition, age classes, and yield tables. Information was taken from these plans to show the general structure and composition of the Forest at that point in time; this can be used to illustrate the changes evident today.

The **Meadows Valley Working Circle** included the area tributary to Meadows Valley (Little Salmon, Boulder Creek, Mud Creek, Price Valley, Hazard Creek, Goose Creek, Meadows Slope, Lost Creek, and Beaver Creek compartments) (Bolles 1928). The forest as a whole supported mixed stands with the following composition:

western yellow pine	23.5%
Douglas-fir	19.0%
white fir	31.8%
spruce	20.0%
larch	5.4%
lodgepole pine	0.3%

The forest was distributed in the following age classes:

Age Class	Acreage	Percent of Area
0-40	15,879	19.0
40-80	116	0.2
80-120	20,196	23.5
120-160	42,344	49.0
160-200	3,753	4.3
200 +	3,078	4.0

The **Middle Valley Working Circle** was located in the southwestern portion of the old Weiser National Forest. It included the heads of all the drainages that empty into Pine Creek, Keithly Creek, Rush Creek, and Goodrich Creek (Fritchman 1936).

Species composition:

ponderosa pine	34.4%
Douglas-fir	58.9%
white fir	2.9%
larch-Douglas-fir	1.0%
Engelmann spruce	2.7%
lodgepole pine	0.1%

Age Distribution:

0-40 yrs	6%
40-80 yrs	3%
80-120 yrs	26%
120-160 yrs	42%
160 + yr	23%

The **South Fork Salmon Working Circle** included the Warm Lake, Boundary-Buckhorn, Knox, Buckhorn Eastfork, Lower Secesh, and Yellow Pine compartments (Miles 1929).

Species Composition:

western yellow pine	48.60%
Douglas-fir	22.53%
lodgepole pine	21.49%
spruce	2.04%
fir	2.00%
larch-Douglas-fir	2.18%
lodgepole-Douglas-fir	1.16%

Age Distribution:

0-40 yrs	1.68%
40-80 yrs	4.07%
80-120 yrs	27.01%
120-160 yrs	32.54%
160 + yrs	34.70%

The **Mann Creek Working Circle** included the extreme southwestern wing of the old Weiser National Forest (parts of Townships 13, 14, and 15 North and Ranges 5 and 6 West, B.M.) (Koziol 1928).

Species Composition:

western yellow pine	55%
Douglas-fir	31%
white fir	13%
larch	1%

Age Distribution:

0-40 yrs	9%
40-80 yrs	1%
80-120 yrs	12%
120-160 yrs	25%
160 + yrs	53%

The **South Fork Payette Working Circle** included the entire drainages of the South and Middle Forks of the Payette River (covering portions of the Payette and Boise National Forests) (Miles 1930).

Species Composition:

yellow pine	63%
Douglas-fir	29%
others*	8%

*Includes small amounts of subalpine fir, white fir, spruce, and lodgepole pine.

Age Distribution:

0-40 yrs	7%
40-80 yrs	8%
80-120 yrs	13%
120 + yrs	72%

The **Council Working Circle** was located within two principal drainages. The largest portion was in the Weiser River drainage, and the balance in the Wildhorse Creek or Snake River drainage (Ritter and Koziol 1931).

Species Composition:

western yellow pine	53%
Douglas-fir	25%
white fir	12%
western larch	5%
Engelmann spruce	3%
lodgepole pine	2%

Age Distribution:

0-40 yrs	4%
40-80 yrs	2%
80-120 yrs	14%
120-160 yrs	48%
160 + yrs	32%

The **Payette Lakes Working Circle** included Thorn Creek, Fisher Creek, Squaw Meadows, Pearl Creek, Lake Fork Creek, and Boulder Lake compartments (West 1931).

Species Composition:

western yellow pine	2.03%
Douglas-fir	2.40%
fir	20.96%
Engelmann spruce	31.55%
larch-Douglas-fir	2.15%
lodgepole pine	31.87%
Douglas-fir-spruce	0.73%
lodgepole-Douglas-fir	0.26%
cut-over (not classified)	8.05%

Age Distribution:

0-40 yrs	29%
40-80 yrs	16%
80-120 yrs	10%
120-160 yrs	29%
160 + yrs	17%

The **Indian Valley Working Circle** covered the southeastern portion of the old Weiser National Forest from Mica Ridge and the Grays Creek-Fall Creek divide to the southern Forest boundary. The compartments in the working circle included: Grays Creek, Mill Creek, Kinghill Creek, Grizzly Creek, Lower Little Weiser, Upper Little Weiser, and Anderson Creek (Fritchman 1937).

Species Composition:

ponderosa pine	56.3%
Douglas-fir	32.5%
white fir	10.0%
spruce	0.7%
lodgepole pine	0.5%

Age Distribution:

0-40 yrs	3%
40-80 yrs	12%
80-120 yrs	22%
120-160 yrs	45%
160 + yrs	18%

Fire—On September 3, 1889, the Idaho Daily Statesman reported a few fires burning in the Forest.

> "...nearly every man of [Rocky Bar] as well as Red Warrior were out in the woods fighting fires that were raging in close proximity to the town and mills. At last accounts the fires had been so checked that there was no further danger apprehended for property in and near the towns. No other losses are reported in that section than that of cord wood and timber a considerable amount of which had been burned. From Long Valley, the startling news comes that the upper end of the valley is being burned; and that the fierce heat that has been prevailing among and around the Payette Lakes has...left their shores and bottoms strewn with millions of red fish.

Fire History—Barrett (1988b) analyzed fire scar data between lower Chamberlain and Disappointment Creeks. This area represents the mesic upper elevations of the ponderosa pine/Douglas-fir type. Twenty-seven fire scar samples were collected in the higher elevation (4,000 to 5,000 feet),

north-facing study area. Eighteen fires occurred between 1730 and 1934, resulting in a mean fire interval of 12 years (range of 13 to 37 years). Six were major fires (>1,000 acres) that burned extensive portions of the analysis area. Most of the sample stands had not experienced fire in the last 50 years or more, but tree plot data suggested that fire exclusion was most evident in the upper elevations. For example, Douglas-fir dominated the stands' understories while ponderosa pine was dominant or codominant in the overstory. Changes in species dominance and fuel buildups were occurring in north- and east-facing stands, especially above 4,000 feet (Barrett 1988b).

Barrett (1984) also analyzed fire scar data from the River of No Return, River Breaks zone. Samples were obtained from nine sample stands along the Salmon River corridor (Killum Point to Groundhog Bar). Twenty-seven samples were taken from ponderosa pine (26) and Douglas-fir (1). Most trees had less than six scars but some had as many as 10. During the presuppression era, mean fire intervals ranged from 10 to 48 years. Most stands have not had fires since 1935. It was, therefore, infeasible to calculate the suppression mean fire interval (Barrett 1984).

Historically, fires were frequent in the dry open stands. These surface fires scarred many trees but rarely resulted in significant stand replacement. Ponderosa pine was the dominant overstory species in a highly uneven-aged regeneration pattern. The more heavily fueled north-facing Douglas-fir/shrub communities commonly had stand-replacing fires with intervals that exceeded 50 years. These stand-replacing events occurred after one or more surface fires (Barrett 1984).

Aridity seems to be preventing Douglas-fir encroachment and heavy fuel accumulations in south-facing stands in the River Breaks. Duff accumulation is probably the most serious result of fire's absence. On north-facing slopes, dense regeneration of Douglas-fir is replacing ponderosa pine in the understories of most stands. The absence of frequent thinning fires are allowing the increase in living and downed fuels (Barrett 1984).

Fire scar data were collected in the Rapid River drainage between North Star Creek and Trail Creek (Barrett 1987). Twenty-three stands were sampled, and 85 increment cores and 12 fire scar wedges were collected. Increment cores and fire scar cross-sections suggested that surface fires recurred on south-facing stands on an average of 43 to 68 years. On northern aspects, stand-replacing fires recurred every 62 to 148 years. In 1987, most north-facing stands were still within their historic range of fire frequencies, but the older age classes appeared to be approaching the upper threshold. Most ponderosa pine stands, however, have not experienced fire in 84 to 108 years. The absence of surface fires has resulted in dense thickets of grand fir and Douglas-fir regeneration (Barrett 1987).

Barrett (1988a) found that fire exclusion has not yet influenced the overall stand succession in the Krassel area of the South Fork of the Salmon River. Fire cycles in south-slope stands (ponderosa pine and Douglas-fir), however, have been disrupted because they are two to four times longer than the pre-1900 intervals. Prior to 1900, surface fires burned every 16 to 35 years. Fuel buildups in south-slope stands have been limited due to the arid conditions. The vigor of browse species such as bitterbrush, serviceberry and willow has been reduced due to the lack of fire. On north-facing slopes (Douglas-fir, grand fir, and western larch) crown fires occurred every 60 to 225 years. The typical size of these fires was 50 to 300 acres (Barrett 1988a). Barrett felt stand-replacing fires did not often occur on moist aspects before 100 years of stand development.

Barrett (1994b) calculated a mean fire interval of 7 years (range of 1 to 33 years) in the mid- to upper-Bear and Indian Creek drainages. His data indicated most fires were underburns in parklike ponderosa pine stands, but a number covered relatively extensive areas of the drainage. Fires in 1804, 1834, and 1844 caused widespread scarring and seral regeneration. Fires relatively closely grouped in time might represent evidence of sequential reburns in previously fire-killed fuels. As many as 8 of the 47 fires in the fire chronology were widespread in the sample area. Several fires in the chronology occurred during well known severe fire years (1889, 1910, and 1919). These widespread fires had a mean fire interval of 48 years (Barrett 1994b).

Samples from the ponderosa pine/Douglas-fir cover type had 10 or more scars each from low-intensity underburns. Pre-1919 mean fire interval ranged from 14 to 30 years. These stands had not burned for the past 74 to 115 years. Despite the lack of fire, these stands were still relatively open; however, they had a substantially increased duff and litter layer. Frequent fires could cause significant mortality due to lethal intensities damaging root crowns. On productive, south-facing slopes at higher elevations, ladder fuels have shifted fire severities from non-lethal underburns to mixed-severity fires (Barrett 1994b).

Mean fire intervals for the ponderosa pine/Douglas-fir/grand fir type ranged from 25 to 40 years. Scarred trees usually had two to four scars each. Moist-site stands often have overstory dominants that are less than 200 years which attest to the recurrence of mixed-severity fires. Most stands had not burned for a century or more (Barrett 1994b).

Dense understories of tall shrubs and shade-tolerant tree saplings and poles have developed under the tree canopies on these productive sites. Plot data suggest there were 30 to 40 trees per acre on relatively frequently burned sites. The combination of fire exclusion and past timber harvest have produced relatively young, single-layer stands that now have more than 200 pole-sized trees per acre. The fire regime pattern has changed from primarily mixed-severity to potentially lethal fires in the future (Barrett 1994b).

Fire scars were relatively uncommon in the lodgepole pine/subalpine fir/whitebark pine cover type. Fire years were estimated from pith years of even-aged lodgepole and whitebark pines as well as from fire-initiated Douglas-firs and western larch in and adjacent to these stands (Barrett and Arno 1988). The four stand mean fire interval was 73 years, but site fire frequency was highly variable in the subalpine zone depending on site type. One parklike stand dominated by old Douglas-firs on a southeast-facing slope contained five fire-initiated age classes dating from the late 1600's (mean fire interval of 49 years for mixed-severity fires). An east-facing stand dominated by lodgepole pine and whitebark pine produced a mean fire interval of 103 years between lethal and mixed-severity fires. A northwest-facing stand dominated by lodgepole and whitebark pine had a single seral age class that was initiated by an 1804 fire, but also contained a few remnant western larch that had been initiated by a fire about 1688 (116 year mean fire interval) (Barrett 1994b).

Intervals ranged widely among all sites (16 to 164 years); the current fire-free interval averages 123 years. Fire exclusion impacts are less clear for the subalpine zone because there was a large degree of variability in fire frequency even before 1900. Individual stands and age classes are aging more uniformly than before 1900 thus, raising the likelihood of more extensive and possibly more severe fires in the future (Barrett 1994b).

Grazing—The first stock grazing use was by Native Americans' horses. Grazing was heavy and concentrated where they camped. Cameahwait's Shoshoni were reputed to have over 700 horses in 1805. Grazing was intermittent by trappers' horses after 1805. Trappers often followed Indian trails and at times they had to move their camps or seek other routes because of overgrazing by Indian horses or those of other trappers. The discovery of gold in 1866 resulted in continued range use. The thousands of people in the Leesburg basin during the first 2 years of settlement needed horses for transportation. Large horse herds used nearby ranges, as did milk cows and later range cattle. Livestock ranged widely year round with little fencing and no stored feed. The only hay produced was for milk cows and horses. The late 1880's brought a change. Increasing numbers of cattle, from importation and natural increase, had caught up with the existing supply of forage and ranges were becoming depleted. By 1890, the high mountain ranges could only be used for summer grazing due to the lack of forage. An 1890 report of the Lemhi County Assessor stated there were roughly 3,400 horses (Smith 1969).

Timber—Early in the 1900's, S.B. Locke (1911) surveyed a portion of the **Hughes Creek drainage**, a small tributary of the North Fork of the Salmon River. The survey included the slope on the south side of Hughes Creek up to and including two small creeks above the West Fork. On the north side of the creek, the area between Ditch and Humbug Creeks was burned in the August, 1910, fire and included in the survey. The burned area extended back from Hughes Creek about a half mile. The excerpts that follow are from the survey (Locke 1911):

Area	Burned	Unburned	Total
Main Hughes Creek	1,690	910	2,770
West Fork	2,290	1,000	3,290
Total	3,980	1,910	5,890

Yellow Pine Type

A large part of the yellow pine is in very pure stands with a few Douglas-fir in the more sheltered places. There is some of this type on the lower north and west slopes but the bulk of it is on the east and south slopes where it is almost universal. It is a permanent type and evidently has been established here for a very long time. The general average of all the trees above 16 inches in diameter is about 20 inches and 80 feet in height. It reproduces very abundantly on the more protected slopes, but does not produce as pure stands there as on the more exposed slopes. There is some scattered Douglas-fir mainly in the more sheltered spots. The result of fire is shown in two ways; in killing the young trees and in causing the mature trees to become catfaced or hollowed out. Practically all the mature timber which falls or dies is the result of damage by this hollowing out.

Yellow Pine-Douglas-fir Type

This is a sort of intermediate type between the pure yellow pine and Douglas-fir types. It occurs on the lower north and west slopes with occasionally the yellow pine type below it and the Douglas-fir above. The general appearance is of large scattered yellow pines with a denser stand of smaller Douglas-fir between. It seems to be permanent, the conditions for reproduction being such that both trees can persist under natural conditions. Where the forest cover has been broken here, dense reproduction of yellow pine is found. It is probable, that because of its greater tolerance, Douglas-fir eventually crowds out much of the pine. The stand varies from 65% yellow pine and 35% Douglas-fir, to 35% yellow pine and 65% Douglas-fir.

Salmon National Forest

Grazing—The first stock grazing use was by Native Americans' horses. Grazing was heavy and concentrated where they camped. Cameahwait's Shoshoni were reputed to have over 700 horses in 1805. Grazing was intermittent by trappers' horses after 1805. Trappers often followed Indian trails and at times they had to move their camps or seek other routes because of overgrazing by Indian horses or those of other trappers. The discovery of gold in 1866 resulted in continued range use. The thousands of people in the Leesburg basin during the first 2 years of settlement needed horses for transportation. Large horse herds used nearby ranges, as did milk cows and later range cattle. Livestock ranged widely year round with little fencing and no stored feed. The only hay produced was for milk cows and horses. The late 1880's brought a change. Increasing numbers of cattle, from importation and natural increase, had caught up with the existing supply of forage and ranges were becoming depleted. By 1890, the high mountain ranges could only be used for summer grazing due to the lack of forage. An 1890 report of the Lemhi County Assessor stated there were roughly 3,400 horses (Smith 1969).

Timber—Early in the 1900's, S.B. Locke (1911) surveyed a portion of the **Hughes Creek drainage**, a small tributary of the North Fork of the Salmon River. The survey included the slope on the south side of Hughes Creek up to and including two small creeks above the West Fork. On the north side of the creek, the area between Ditch and Humbug Creeks was burned in the August, 1910, fire and included in the survey. The burned area extended back from Hughes Creek about a half mile. The excerpts that follow are from the survey (Locke 1911):

Area	Burned	Unburned	Total
Main Hughes Creek	1,690	910	2,770
West Fork	2,290	1,000	3,290
Total	3,980	1,910	5,890

Yellow Pine Type

A large part of the yellow pine is in very pure stands with a few Douglas-fir in the more sheltered places. There is some of this type on the lower north and west slopes but the bulk of it is on the east and south slopes where it is almost universal. It is a permanent type and evidently has been established here for a very long time. The general average of all the trees above 16 inches in diameter is about 20 inches and 80 feet in height. It reproduces very abundantly on the more protected slopes, but does not produce as pure stands there as on the more exposed slopes. There is some scattered Douglas-fir mainly in the more sheltered spots. The result of fire is shown in two ways; in killing the young trees and in causing the mature trees to become catfaced or hollowed out. Practically all the mature timber which falls or dies is the result of damage by this hollowing out.

Yellow Pine-Douglas-fir Type

This is a sort of intermediate type between the pure yellow pine and Douglas-fir types. It occurs on the lower north and west slopes with occasionally the yellow pine type below it and the Douglas-fir above. The general appearance is of large scattered yellow pines with a denser stand of smaller Douglas-fir between. It seems to be permanent, the conditions for reproduction being such that both trees can persist under natural conditions. Where the forest cover has been broken here, dense reproduction of yellow pine is found. It is probable, that because of its greater tolerance, Douglas-fir eventually crowds out much of the pine. The stand varies from 65% yellow pine and 35% Douglas-fir, to 35% yellow pine and 65% Douglas-fir.

The growth and quality of the pine is excellent as is the reproduction. The damage is chiefly from fire as in the yellow pine type only greater due to the denser ground cover. The Douglas-fir reproduces well here. Considerable damage is caused by mistletoe. Fires do not hollow out the Douglas-fir, but cause long catfaces on the butts.

Douglas-fir Type

Occurs on the upper steep slopes having a northern or western aspect and on rough poor sites. The reproduction is good as far as amount goes but does not maintain its growth well. Both the old and young stands suffer severely from fire. The young growth has been repeatedly burned on the steep slopes so that at present most of the stand is immature. The very common damage from mistletoe causing witches brooms may be indirectly due to lowering the vitality of the trees from successive fires.

Lodgepole Pine Type

The lodgepole pine type is limited to the highest part of the watershed of the West Fork and the upper of the two small creeks above West Fork. The highest part of the divide is covered with pine and several narrow patches of it extends into the Douglas-fir type. The trees are about all pole size and too inaccessible to be of present commercial value.

Compartment I

This area is unburned and consists of 680 acres on the south side of Hughes Creek up to the edge of the burned area which is about opposite the mouth of Ditch Creek. Included in this tract is about 50 acres around Lightning Peak. The stand is mostly of fir poles and saplings, in strips running up and down the west slopes with strips of grass on the east slopes. There are scattered large yellow pine on the lower slopes. Practically all the reproduction is Douglas-fir. Saplings are very dense in places, running up to 30,000 to the acre. About 55% of the merchantable volume is yellow pine and 45% Douglas-fir. This proportion is due to the fact that yellow pine is mostly large and merchantable while the fir is of rather small size.

Compartment II

Just below Gallagher Gulch there are about 330 burned-over acres. The stand is mostly fir poles and saplings, patchy with open ridges between them. There is some scattered yellow pine on the lower slopes but on the whole very little merchantable timber. Reproduction is good both of pine and fir. The original stand was 65% Douglas-fir and 35% yellow pine. After the fire it was about 70% fir and 30% pine. The damage from fire was very severe here, about 45% being so badly burned that it was classed as dead. In many places a greater part of the sapling stands were burned clean, especially the upper steep slopes where they were very dense.

Compartment III

In this compartment there are 750 acres of burn located between Gallagher Gulch and the drainage of the West Fork. The stand in the upper gulches is Douglas-fir, while below that is the yellow pine which is mostly large and mature. About 10% of the merchantable timber is defective due to the effect of several fires. In the last fire the scanty yellow pine reproduction was practically all killed. Near the top and especially on the northwest exposures there was a dense stand of fir poles which was burned bare in patches. The original stand is fire killed, one-fifth of which is down.

Compartment IV

This includes the burned area between Humbug and Ditch Creeks, about 440 acres. The stand is pure pine with scattered fir near the streams. Most of the timber is mature and catfaced by this and previous fires, this damage amounting to 5% of the living trees. About 13% of the timber was killed by the fire in 1910,

of which about two-fifths is down. The reproduction was fair except on the ridges where there was scarcely any. The fire killed 75% of the seedlings and saplings, but where it did not sweep the area, the reproduction is excellent.

Compartment V

There is great variation in the stand in this compartment, but the general type of country is uniform. It includes the area on the east side of the West Fork of Hughes Creek up to the low saddle between the East Branch of the West Fork and Spring Creek as far as the fire burned. The entire area was burned over in 1910.

The stand on the lower slopes is chiefly yellow pine changing on the higher slopes and those further up the stream to fir. Above the pine there is very little timber of merchantable size, practically all of it being dense fir and lodgepole reproduction. The entire area, with the exception of a long narrow east slope covered with a very open growth of yellow pine, is characterized by a dense reproduction. This is of yellow pine and Douglas-fir on the lower slopes, with lodgepole and Douglas-fir on the upper slopes. The damage of importance is from fire. Because of the steep slopes, the presence of a considerable amount of duff on the ground, and the dense reproduction, a fire here causes very severe damage. On the upper slopes in the recent fire there were large patches where the fire burned everything clean. The damage in the merchantable timber was about 15%, and so badly injured that much of it will be a loss and about 5% actually killed. The large trees are damaged chiefly by the burning of pitchy catfaces caused by previous fires thus hollowing the butts so the trees are either killed or broken off by the first strong wind.

Compartment VI

This compartment includes the headwaters of the West Fork which consists of two branches. Only a part of it was burned over in 1910. The reproduction of the yellow pine is fair, and that of Douglas-fir and lodgepole very good. The southeast slopes are rather open, but the remainder has a dense stand of young growth. Fire as usual causes the greatest damage. The recent fire burned a patch of young growth on the East Branch. On the burned area there was about 5% of the merchantable timber fallen because of the fire and 12% badly damaged. About one quarter of the area was burned over, most of it being on the East Branch. It is quite possible that an explanation of the location of the merchantable timber on the southeast and the young growth on the northwest slopes may be found in the effect of past fires. In the more open slopes where there was little humus and no dense cover of reproduction, the fire was not hot enough to kill the trees, while the conditions on the other slopes being opposite, the fire was hot enough to burn everything clean.

Compartment VII

This compartment, with the exception of a small patch of yellow pine poles near a low notch into Hughes Creek, consists of a solid body of yellow pine timber on the west side of the West Fork from Hughes Creek up, the lower part of the west side of the West Branch, and a narrow strip on the east side of the West Branch. The yellow pine, of which practically the entire stand consists, is of very good quality, the stand is fairly dense, and about 80% mature. Reproduction here is very poor. Most of the slopes are quite exposed and while there might have been fair reproduction before, the recent fire there has scarcely left any. The percentages killed by fire are:

	Seedlings	Saplings	Poles
		Percent	
Yellow pine	90	36	53
Douglas-fir	89	56	100

Compartment VIII

This is a small compartment of two small gulches on the south side of Hughes Creek above the West Fork. The best of the timber is from the West Fork up to and

including the first gulch. The stand is about all yellow pine of large size and good quality. On Ibex Creek there is a mixed growth of yellow pine and fir lower down and at the head a tie stand of lodgepole and fir. The pine is for the most part mature and the Douglas-fir attacked by mistletoe. Reproduction is very good for all species over most of the area. There is an old burn on the lower west side of Ibex Creek which is not restocking. It has at present a dense ground cover of ceanothus. The fire of August, 1910 burned the first gulch and a short distance into the Ibex Creek watershed. About 70% of the seedlings and saplings were destroyed in the burned area. It was estimated that 50% of the yellow pine and Douglas-fir was catfaced due to fires.

The **Lake/Camp/Deer/Rattlesnake/Iron Creeks** were surveyed by Crowell and Sparhawk (1910). A description of the Forest Types follow:

Douglas-fir Type

Douglas-fir is the principal forest type in regard to area and importance. It normally grows in pure stands and is located principally between 6,000 and 8,000 feet. At lower elevations the type is restricted to the northern exposures and scattered trees and small stands are sometimes found as low as 4,500 and 5,000 feet. At higher elevations it occurs also on southern exposures although the stands thus exposed are generally quite open. The upper edge of the fir type is poorly defined, since in the past repeated fires have burnt over large areas on which lodgepole pine has taken possession.

Lodgepole Type

Principal stands of lodgepole are found on burned areas in the Douglas-fir zone. These stands are of temporary character if fire can be kept out. The area upon which lodgepole can persist if it were not aided by fire is probably very small, and is restricted to rather exposed ridges where it mingles with whitebark pine.

Spruce Type

Along the creeks and gulch bottoms a narrow strip of spruce is often found, sometimes consisting of either scattered trees or very dense stands. On protected slopes above 8,000 feet, the reproduction often consists to a large extent of balsam, and with this balsam is sometimes found spruce. The indications are that were it not for the disturbing influence of fire, a narrow strip of spruce-balsam forest would spring into existence on some of the highest slopes and ridges.

Open Land

Separating the bodies of timber are treeless areas or areas having only a very scattered growth of trees. The absence of tree growth upon a large part of this land is due to past fires.

Table 15 summarizes the number of trees per acre by size class for different cover types, as determined in the Crowell and Sparhawk survey.

Herman Work, a graduate student at Pennsylvania State College, wrote a master's thesis in 1913 on the relationship between the natural resources within the Salmon NF and the local community. Included in the thesis was a description of the vegetation (Work 1913):

Yellow Pine Type

A diameter of 40 inches is quite common in mature stands and such trees commonly run from four to seven logs (16 foot) with 40% to 60% clear lumber. Trees seldom reach an age in excess of 400, although diameters of five feet are reached. This type occurs north of the Salmon River in a broad irregular band extending from Fourth of July Creek to the western extremity of the Forest, below Horse Creek. This band is cut by high ridges on which fir and other species occur and by barren and grass areas. The best stands of pine occur on Fourth of July,

Table 15—Salmon National Forest survey. Number of trees by location, species and diameter in 1910 (from Crowell and Sparhawk 1910).

LOCATION	AREA	SPECIES	DBH 0-4"	4-6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	36	37	40+
West Side Degan's Ridge	1 ac.	Douglas-fir	538	313	22	9	11	12	19	10	4	7	4	5	7	4				2	1										1					
		Lodgepole			1																															
		W. Bark pine	1	2																																
West Side Degan's Ridge	1.2 ac.	Douglas-fir	113	206	33	18	14	18	4	16	5	3	1	5	3	3	1	1			1	1			2	1										1
West Side Degan's Ridge		Douglas-fir	4	104	19	17	28	13	11	11	4	4	2	4	3		1																			
South of Spring Hill	1 ac.	Douglas-fir	193	84	8	2	3	3	4	3	3	2	6	3	4	3	2	1	3		2											1				1
South side of gulch		Lodgepole		3					1																											
West Side Degan's Ridge	1 ac.	Douglas-fir	10	166	15	12	7	6	1	3	1	1	1	7	1	4	3	2	1	3						1	1						1			
North Fork Iron Creek																																				
West Side Degan's Ridge	1 ac.	Douglas-fir	93	406	17	18	17	9	8	2	4	7	6	2	3		3	1	1		1	2	1													
Iron Creek																																				
Lower Part		Douglas-fir	900	1114	15	10	8	9	10	7	4	12	3	2	2				2	1	1				1					1	1					2
Upper Lake Creek		Lodgepole	11	74	6	8	7	4	5	2																										
		Spruce	2	5				1		1																										
Lower Part, Upper Lk. Cr.		Douglas-fir	1667	2062	34	21	16	12	9	12	8	7	7	7	5	2	1		2																	
Lower Part	.5 ac.	Douglas-fir	518	232					2			2	2																							
South Fork Lake Creek		Lodgepole	34	652	40	28	18	22	20	18	6	2																								
Main Fork of Iron Creek		Douglas-fir				1							2				1	2	2		3		1													
Spruce Gulch		Lodgepole					1	1				1																								
		Balsam	648	788	13	7	8	10	4	7	1			2	1	1	1		1		2															
		Spruce	48	70	5	7	5	3	4	7	4	2	9	5	4	8	5	4			3		1	1		1		1								
Main Fork of Iron Creek		Live Balsam	230		2	4	4	3	4	4	5	1	3			2	1	1																	
Spruce Gulch		Dead Balsam									1		1		1	1																				
		Spruce	20		13	11	12	11	8	10	17	11	13	12	9	9	8	8	9	9	3	2	3	2	2	1	3			1	1				1	
		W. Bark pine							2																											
Main Fork of Iron Creek		Balsam	204	259	12	8	6	5	3	4	2	3	1				2						1													
Spruce Gulch		Spruce	42	17	11	8	7	10	13	15	14	10	8	13	7	7	9	7	8	9	3	3		4	1	3	2	5		1	1			1	1	
Main Fork of Iron Creek		Lodgepole		106	120	84	83	69	41	36	8	3	1	1					1																	
Bear Point		Balsam	301	173	1	2	1	2		1	1			1																						
		W. Bark pine	6																																	
Main Fork of Iron Creek		Lodgepole	20	70	95	79	81	96	48	21	8	3	1																							
Bear Point		Balsam	140	70	1	3	1		1	3																										
		W. Bark pine	60																																	
Divide between Iron Creek		Lodgepole	5																																	
and Moyer Creek		Balsam	30			1		1	1	1	1		1	1				1																		
		W. Bark pine	91	19	7	13	16	26	31	17	26	15	9	11	6	2	4	1	1		1															
Divide between Iron Creek		Lodgepole	112	28		5	1	2	1	7	2	4	1		2	2	1	1	1																	
and Moyer Creek		Balsam	3	9				1	2																											
		W. Bark pine	67	13	3	5	9	8	11	13	10	15	8	5	2			1																		
Divide between Iron Creek		Lodgepole		23	16	8	13	22	21	19	10	4	10	12	2	2								1												
and Moyer Creek		Balsam	71	10	1		1		1			1																								
		W. Bark pine	103	51	15	24	37	17	19	15	6	6	1	3								1		2									1			
Divide between Iron Creek		Lodgepole	1		1	1	1	3	2	9	7	3	7	4	3		2		2																	
and Big Creek near		Balsam	130	15	1	1	1	1				1				1																				
Squawboard		W. Bark pine	147	306	8	4	4	1	4	3	2	1	6	6	3	1	4	3	2	3	2		2	4	1	3	1	2								1
Divide between Iron Creek		Lodgepole	20	10			1			3	3	1	1	4	1	3	3	1	1	1	2	1	1													
and Big Creek near		Balsam	17	13		7																														
Squawboard		W. Bark pine	118	192	3	3	3		5	5	6	8	2	1	7	7	2	3	3	3	3	1	3	1	3		1	1								
South Fork Iron Creek		Douglas-fir	330	369	7	3	7	7	9	5	2	5	1	2	3	9	5	1	1	1	1		1					1					1			1
		Lodgepole	1	1			1																													
South Fork Iron Creek		Douglas-fir	843	346	14	10	6	5	1	4	6	3	8	1	6	3	6		2	3	1	1	1				1					1	1			
South Fork Iron Creek		Douglas-fir	428	606	6	7		6	6	4	3	1	2	5		2	4	1	2	2	4	2		1			1									
South Fork Iron Creek		Douglas-fir	294	440	2	7	2	2	2	3	4	4		4	2	4	3	1	2	1	2	1				3	2					1			
		Lodgepole		22	2	2	2	2	2	4		1																								
South Fork Iron Creek		Douglas-fir	1638	449	1	1	1	5	2	5	1	7	9	8	2	7	3	4	1	3		3					1	1					1			
		Lodgepole	4	91	2	1	4	4																												

Wagonhammer, Anderson, Hughes, Sage, Squaw, Boulder, Owl, and Colson Creeks. The type is pure in various places throughout this range, notably in the lower, rolling lands of Ditch, Ransack, Squaw and Owl Creeks. On Lick, Fourth of July, Wagonhammer, Hughes and many other creeks, the moderate northerly slopes show strong competition between yellow pine and Douglas-fir, while the southerly exposures are usually pure pine. Young growth is more plentiful in mixed virgin stands than in pure old pine. Hundreds of acres of open pine on Hughes Creek have little young growth, while mixed stands in the same region have abundant reproduction.

Bunchgrass, lupine, small sunflower and painted cup are characteristic herbs in the pure type and they are much less plentiful or entirely absent in mixed stands. Pinegrass occurs in half-shaded places throughout the Forest. The mixed stands usually have considerable brush, notably alder and willows. Huckleberry and snow drop [perhaps snowberry, *Symphoricarpos* spp.] are common over most of the yellow pine country while ceanothus, cherry and serviceberry occur in openings and ninebark, willow, alder, aspen, red dogwood, rose, elder and Hawthorne follow the streams and seeps [fig. 2-8].



Figure 2—Yellow Pine standards and seedlings on Ransack Creek, northerly exposure, age 6 to 12 years.



Figure 3—Yellow pine poles on Humbug Gulch. The ceanothus in the foreground indicates that this area was included in old fires that swept the neighborhood. This particular spot was burned over in 1910 but the damage to the poles was not important.



Figure 4—This yellow pine stand has been opened up by successive fires. The brush cover is heavy for the type. Reproduction is almost entirely absent. A direct seeding site. Hughes Creek.



Figure 5—The large tree (44"d.b.h.-7 logs) was weakened by the 1910 fire and fell under a heavy wet snow one year later. Mature yellow pine on Humbug Gulch.



Figure 6—This stand of yellow pine on Humbug Gulch will cut 35 M per acre. The trees average 30"d.b.h. and 5 or 6 logs.

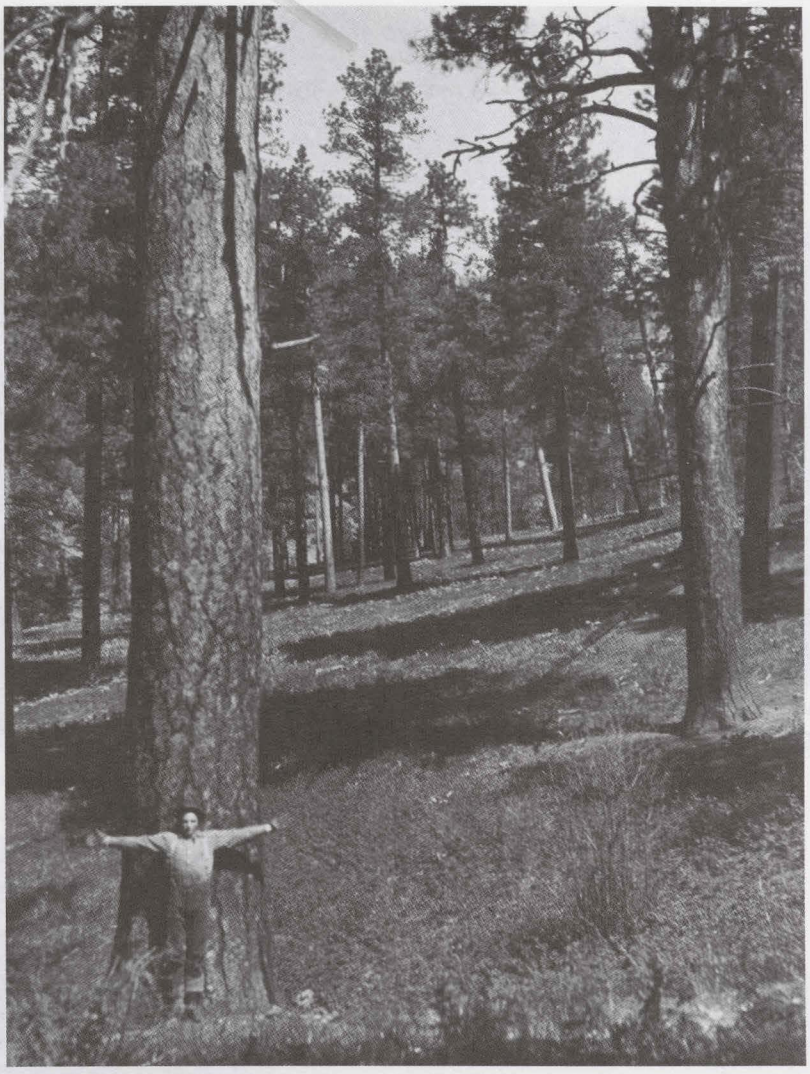


Figure 7—Large overmature trees on a bar in Humbug Gulch. Typical pure yellow pine country.



Figure 8—A "June 11" ranch at the mouth of Sheep Creek. The dark band of timber is yellow pine, a large amount of which has been cleared from the ranch. The steep, southerly slope of Sheep Creek has little forest cover.

Douglas-fir Type

Douglas-fir attains an average maximum diameter of 40 inches. Heights vary from three to six logs. This type occurs chiefly in the region south and east of the yellow pine country. Grass and sagebrush slopes and ridges interrupt the timber and the country as a whole is much less adapted to tree growth. The best stands occur on Iron and Lake Creeks on the main Salmon River drainage and on Timber Creek and shorter streams on the Lemhi drainage. All ages are present in most places, although small patches of like age are frequently found. The northerly slopes are usually fairly well timbered, while southerly slopes are likely to be very open or barren of tree growth, depending on elevation and proximity of ridges to the south. On many northerly slopes lodgepole comes in at 5,500 to 6,000 feet and needs little help from fires to make it temporarily predominant.

Open stands of fir have some of the characteristic herbs of the yellow pine type (lupine, painted cup, sunflower, and bunchgrass). Small sagebrush is commonly found in the open fir areas. Denser stands have little or no ground cover, especially in the higher country where the snow lies late. Aspen occupies the stream bottoms in the southern part of the type to a greater extent than in the northern part. Buckbrush, cherry, ceanothus and rose are common on southerly slopes, or where there have been fires [fig. 9-12].



Figure 9—Looking down Hughes Creek from the ridge between the forks. The northerly slope to the right has yellow pine and Douglas-fir, principally the latter species, while the opposite slope has pure yellow pine.



Figure 10—Showing the distribution of grass and timber on steep slopes in the mixed yellow pine and Douglas-fir zone. The camera was facing a little east of south. North Fork.

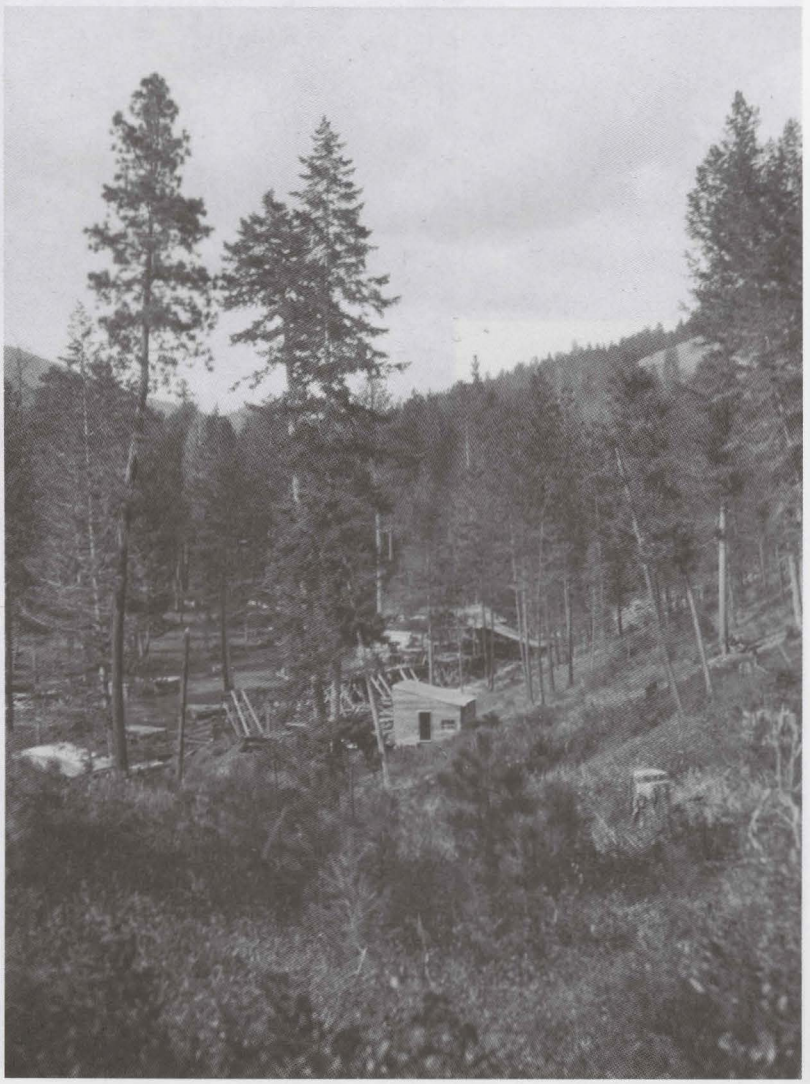


Figure 11—Douglas-fir comes in on north slopes within the yellow pine type. Ditch Creek.



Figure 12—Looking down Turner Gulch, a branch of Jesse Creek, the source of Salmon's water supply.

Engelmann Spruce

Spruce attains an average maximum diameter of three feet with a height of five or six logs. However, the tree occurs so sparingly that it has little practical importance.

Lodgepole Pine

Lodgepole seldom shows a diameter greater than 20 inches or a height greater than 80 feet. The most important bodies of lodgepole pine are on the Big Creek drainage, notably about the headwaters of Napias Creek. Other large bodies occur on Timber Creek well up the Lemhi River and on some of the creeks flowing into the Salmon River from the Salmon River Range. Stands are nearly always even-aged because most originated after fires.

This type is conspicuously lacking in herbaceous growth because the snow comes early and stays late, and the shade is dense. Moose grass in moist high places and pinegrass elsewhere are plants having no forage value. Openings usually have an abundance of quick growing plants that are valuable for sheep feed. Alder frequently occurs as a sort of understory on northern slopes. The alder trees are strongly bent over by the snow and often have very little light.

In 1923, F.H. Eyre surveyed portions of the **Gilmore Working Circle**. Tables 16-18 summarize the number of trees per acre by size class. Kneipp (1926) also surveyed the working circle and portions of his data are found in table 19.

Grazing

The Forest Range is very much understocked, as a whole, because of the difficulty of getting stock in and out of the down-river country. The present authorization is for 72,600 sheep and 15,500 cattle and horses. An important feature of the grazing business is that of the reduction of fire danger by removing ground cover and by keeping people in the hills with valuable property during the fire season.

Fire History—Barrett (1988b) analyzed fire scar data in the lower Colson Creek drainage six miles east of the River of No Return Wilderness boundary. The study area ranges from 3,000 to 5,000 feet in elevation and

Table16—Number of trees per acre by cover type and size class in the Gilmore Compartment (Salmon National Forest) in 1923 (Eyre1923).

Logging unit	Patch	Area	Douglas-fir			Lodgepole pine			Engelmann spruce			Alpine fir			Limber pine		
			4-8	10-12	14+	4-8	10-12	14+	4-8	10-12	14+	4-8	10-12	14+	4-8	10-12	14+
		Acres							*Inches*								
Box Canyon	A	46	57.0	48.0	20.0				13.0								
	B	20	43.3	25.0	11.7				6.5	13.3							
	C	22	9.0	13.0	25.0				10.0		4.0	2.0	1.0		55.0	47.0	2.0
Long Canyon	A	128	122.9	35.9	8.2												
	B	140	69.7	36.1	19.0	1.8	2.0	3.1	8.7	2.1		15.5	0.5		1.1	1.3	3.0
	C	16	12.5	17.5	15.6	8.1	11.2	1.5		0.6		20.6	0.6		1.9	3.7	
	D	24	9.0	7.5	13.0		1.0		0.5		0.5	2.5	1.0		3.0		2.5
	E	88	18.8	16.9	12.3	10.0	3.8	17.8		4.6	3.8	36.9	5.4		7.7		
	F	59	6.8	4.4	7.8	63.6	33.5	1.4	1.1			25.7	2.0		4.1		
	G	27	9.3	4.9	6.4	248.6	10.0	9.1				22.1					
	H	80	6.0	1.8	5.6	88.3	30.8		4.2	1.6	0.6	37.4	6.1		1.0	1.2	0.8
L. Silver Moon	A	64	114.3	32.3	13.7				25.0	4.6	1.0						
	B	80	110.0	36.8	34.3				2.5	6.5	9.5						
Silver Moon	A	44	63.8	27.8	24.7				18.5	9.5	5.5				13.5	9.0	6.0
	B	65	114.3	46.8	35.7												
	C	51	172.6	35.0	21.5				2.6								
	D	9	201.4	1.4	1.4				62.9								
	E	40	120.8	38.9	20.3				187.9	18.2	8.3						
Liberty Gulch	A	161	145.0	28.4	18.7				5.2	1.8	0.7	0.3			3.9	2.3	0.6
	B	66	16.5	7.0	6.0				33.5	11.0	4.5	0.5			44.5	16.0	3.0
Meadow Lake	C	93	5.1	8.6	2.7	112.5	42.3	7.7	0.2			4.9			23.5	3.2	1.3

Table 17—Number of acres in each cover type in the Gilmore Compartment (Salmon National Forest) in 1923 (Eyre 1923).

Logging unit	Douglas-fir	Lodgepole pine	Subalpine fir	Limber pine	Sage	Mahogany
Box Canyon	157			46	264	
Long Canyon	672	166	278	70	50	54
Little Silver Moon Gulch	157		14		16	11
Silver Moon Gulch	245		246		34	45
Liberty Gulch	304		192			16
Meadow Lake Creek	66	191		532		
Totals	1,601	259	730	648	364	126

Table 18—Number of trees per acre by size class and cover type for the Timber Creek Compartment (Salmon National Forest) in 1923 (Eyre 1923).

Logging unit	Patch	Area	Douglas-fir			Lodgepole pine			Engelmann spruce			Alpine fir		
			4-6	8-10	12+	4-6	8-10	12+	4-6	8-10	12+	4-6	8-10	12+
		Acres	*Inches*											
Adams Creek	A	56	21.3	13.3	20.4	5.3	5.5	0.9						
	B	93	2.0	4.0		170.0	20.0							
	C	75	23.3	7.3	12.7	89.3	22.6	2.0						
	D	154	75.0	35.0	14.5									
	E	19	46.0	16.0	6.0	52.0	6.0							
	F	256				171.0	71.0	17.0						
Milk Creek	A	124	35.0	23.0	9.0	4.0		2.0	2.0	0.5		3.0	1.0	
	B	433				171.0	71.0	17.0						
Middle Fork	A		75.0	35.0	14.5									
Timber Cr.	B		81.0	27.5	42.0	2.0	0.5	0.5				13.0	1.5	0.5
	C		8.0	4.0	7.0	3.0	4.0	5.0	26.0	18.0	68.0	5.0		2.0
	D			4.0	16.0	72.0	28.0	12.0						
North and	A	80	28.2	18.8	15.7	30.2	12.2	6.0	2.5	0.7	0.7	3.0	2.5	0.2
Middle Fork	B	91	6.0	2.9	6.0	77.6	30.0	9.3	0.6		2.6	22.0	8.0	
Swan Creek	C	125	27.2	11.6	6.8	69.2	22.4	5.2			1.2	10.8	4.0	
	D	59	46.0	16.0	6.0	52.0	6.0					14.0	8.0	
South Fork	A	38	28.2	18.8	15.7	30.2	12.2	6.0						
Swan Creek	B	16	11.0	16.0	36.0	6.0	2.0	1.0				11.0	1.0	1.0
and Lost Creek	C	255	5.0	1.0	7.5	76.0	45.5	23.0				8.0	3.5	1.5
	D	113	81.2	41.0	33.2	8.0	10.5	7.7				1.7	0.5	
Grove Creek	A	35	42.8	24.5	37.7	4.0	4.0	8.0				1.0	0.5	1.0
	B		16.6	6.6	4.0	93.3	38.6	26.6				3.3		

Absence of figures in the "Area" column indicate that type has not been completely mapped.

Table 19—Number of acres in each cover type for the Gilmore Working Circle (Salmon National Forest) in 1926 (Kneipp 1926).

Types	Acreage
Timber types	
Productive	
Douglas-fir	6,262
Lodgepole pine	1,601
Non-productive	
Engelmann spruce	88
Sub-alpine fir	5,475
Total acreage timber types	13,426
Treeless types	
Barren	6,909
Grass	3,154
Sage	2,167
Brush	1,234
Total acreage treeless types	13,464
Total acreage	26,890

represents lower elevation xeric communities. Seventy-five scar samples were collected, all but one from ponderosa pine. Approximately 59 fires burned between 1707 to 1919. Of the 59 fires, 11 were major (>1,000 ac) events. Some were probably greater than 1,000 acres due to the steep slopes and relatively dry forest types that rise for several thousand feet beyond the study area. The mean fire interval ranged from 10 to 18 years. Fires were very frequent and these estimates may be conservative because fast-moving surface fires would not always have scarred the sample trees (Barrett 1988b).

Ponderosa pine is still successfully regenerating despite fire's absence. On south aspects the aridity of pine habitat types prevents the establishment of substantial numbers of Douglas-fir seedlings and also limits tree densities. Fuels are naturally sparse in these stands, thus fire behavior is not expected to differ markedly from the historic pattern (Battett 1988b).

Sawtooth National Forest

Snake River Plains—Most of the early observers were from more humid areas of eastern North America, and the arid conditions, long distances, lack of water, and strange plants must have made these travelers uneasy (Peters and Bunting 1994). Most west-bound travelers, leaving Missouri in the spring, did not reach the Snake River plains until late summer when most of the forage was dormant. The impression given by accounts for the area was that big sagebrush was an overwhelming dominant in the region. In 1843, J.C. Fremont noted the lower Snake River Plains (area west of a line from Arco to American Falls, ID) had a barren appearance, sandy, and densely covered with the sagebrush from the banks of the river to the foot of the mountains (Peters and Bunting 1994).

Prior to the 1890's, only a few native grass species occupied the early seral position in disturbed landscapes. The fescues (*Festuca octoflora* and *F. megalura*) were the primary annual grasses. These species would increase

for a few years following disturbance and then would be replaced by perennial species such as squirrel tail, Idaho fescue, bluebunch wheatgrass, rabbitbrush, and sagebrush. Fire historically occurred in the communities at intervals of 20 to 100 years and a successional cycle of early seral perennial to late-seral perennial (sagebrush-bunchgrass) dominance was thought to have occurred. The introduction of cheatgrass and medusahead has significantly altered the dynamics of these rangeland ecosystems by changing the fire regime and successional patterns (Peters and Bunting 1994).

The vegetation was historically shrub-bunchgrass communities, with bunchgrasses occupying the interspaces between the shrubs. Fire occurred in the more arid communities only if the sagebrush was sufficiently dense to carry a fire, as the bunchgrasses did not provide adequate continuous fuel. As a result of the introduction of exotic annuals into the Snake River plains, the historical successional patterns after disturbance were altered (Peters and Bunting 1994).

Frequent references to the lack of abundant forage for livestock imply that such growth was far from luxuriant. Stands of grass were usually confined to wet valley bottoms, moist canyons, and mountain slopes. Most of the intermountain West was covered not by grass, but by thick stands of shrubs, when the first Euroamericans began exploring these areas. Dominance of shrub vegetation today cannot always be considered evidence of overgrazing. Grazing has caused an increase in the density of shrubs, but woody shrubs were an important component of the pristine ranges of the semiarid West (Vale 1975).

According to statements from the old-timers living in the area of the Minidoka NF (Twin Falls and Burley RD's), the sagebrush plains and foothills were densely carpeted with bunchgrass (*Agropyron spicatum*), white sage (*Artemisia cana*?), buckbrush (*Purshia tridentata*), and shadscale (*Atriplex* spp.) (Forest Service 1942). Overgrazing, together with the droughts of 1886 and 1891, seriously depleted these forage plants; they were frequently replaced by sagebrush.

Grazing—Maximum cattle and horse stocking on the Minidoka NF occurred during the middle 1880's. It was evident the range was overcrowded and good range conditions could not be maintained with the heavy stocking. The first sheep arrived in 1874 (a band of 3,000) from Nevada. Beginning about 1891 when many of the cattle outfits were wiped out from droughts and overgrazing, sheepmen began to come in with large bands of sheep from Nevada. Sheep soon spread over all divisions of the southern end of the Forest, with the exception of the Cassia Division, where the cattle barons were still influential enough to keep most of them off (Forest Service 1942).

In 1874, the first cattle came to Camas Prairie and stayed on the flats until around the 1890's when they began grazing the foothills. By the late 1880's and 90's, a large number of sheep were using the range. It is reasonable to assume livestock began grazing on the Forest almost immediately after the first ranches were established adjacent to the Forest (Forest Service 1941).

Timber Harvest— In the 1880's, several small mills were set up on the **Minidoka National Forest**. Douglas-fir lumber was used on the ranches surrounding each division. In 1910, there were six mills operating on the Albion Mountain Division. In a few years, most of the merchantable Douglas-fir was removed, so they cut subalpine fir. Because all the timber on the

Cassia Division was either lodgepole, too small to make sawtimber, or was defective subalpine fir, only an occasional mill was established for short periods (Forest Service 1942). Several mills were established in the 1900's on the Raft River, Black Pine, and Sublett Divisions.

In 1920, a preliminary management plan for the Minidoka NF was prepared for all divisions. Because all parts of the Forest were easily accessible and the surrounding valleys had been settled for several years, the timber had been culled over a number of times. The Plan described the timber on the Cassia West Division as being almost exclusively lodgepole pine with poles and houselog sizes predominating. In the early days, the Albion Mountain Division contained a considerable amount of sawtimber. The greater part was removed before the establishment of the Forest. The timber of this Division consisted of a mixed stand of Douglas-fir and subalpine fir with considerable patches of lodgepole pine on old burns (Forest Service 1920). More timber had been cut from the Raft River Division than from any portion of the Forest, due to the early settlers and the dry farming boom around the Forest from 1911-15. The reproduction of Doulgas-fir was exceptionally good. It appeared aspen would be replaced by fir. The timber of the Black Pine Division was concentrated on the east side of the mountain in Pole, Jones, Sweetzer, and Mud Springs canyons. Each canyon contained stands of Douglas-fir with a small mixture of subalpine fir. Most of the timber on the Sublett Division was located in North Heglar Canyon, Hartley, and Side Canyons; they contained enough sawtimber to briefly set up a mill. The timber in all the canyons was Douglas-fir with a small mixture of lodgepole pine (Forest Service 1920).

Table 20 summarizes the number of acres in each cover type for the Burley-Oakley Working Circle (part of the Minidoka NF) in 1921.

In 1910, C.P. Wilber prepared a report that contained descriptions of the vegetation in the **Big Wood River watershed**. Timber occurred on the

Table 20—Number of acres in each cover type for the Burley-Oakley Working Circle (Sawtooth National Forest) in 1921 (Forest Service 1921).

Compartment	Lodgepole pine	Alpine fir	Juniper	Aspen	Brush	Sagebrush	Grass	Total
Barrington	147			440	41	7,160		7,788
Coal Pit	553			1,561	26	13,360	11	15,511
Basin Patch	443		992	2,229		27,170		30,834
Sawmill	439			316	16	2,665	7	3,493
Ecklund	212			127		880		1,199
First Fork - Second Fork	614	92		1,187	54	4,760		6,707
Lower Third Fork	175	138		1,649	196	3,360	329	5,847
Upper Third Fork	731	168		417	39	870		2,225
Trapper Creek	739	193	7,687	1,159	185	23,233		33,095
Badger Gulch - Trout Creek	406	155	15	748	178	7,470	385	9,358
Cottonwood	775	23	3,910	578	37	15,370		20,693
Total National Forest Land	5,284	769	12,504	10,411	772	106,278	733	136,751
Alienated Land (Coal Pit Comp.)	29		413	50	41	2,395	14	2,942
Grand Total	5,313	769	12,917	10,461	813	108,673	747	159,693

north- and west-facing slopes and was distributed in strips and patches, forming a very irregular, broken cover. The forest was composed mostly of uneven-aged stands with mature and overmature timber. Injury by fire (fig. 13) affected large areas, and ranged from complete destruction of the stand and reproduction to minor injuries (Wilber 1910). This could be seen in Adams Gulch, Owl and Coyote Creeks, and portions of the Warm Springs Creek basin. Throughout the watershed, mistletoe was attacking all commercial species and was considered the greatest threat to present and future stands. Nearly all accessible stands had been entered before 1910 either for the railroad, mining timbers, or sawlogs. Deer Creek, Greenhorn Creek, and Warm Springs Creek (fig. 14) had been denuded on the lower portions. The area in the immediate vicinity of Galena had also been heavily cut (Wilber 1910).

Douglas-fir comprised the bulk of the merchantable timber and was found on the lower portions of the watershed. It grew mostly in pure stands with some lodgepole growing below and subalpine fir on the higher slopes above (Wilber 1910) (fig. 15).

Subalpine fir was located throughout the watershed, but comprised a much smaller percentage of the stand. It generally occurred on higher slopes and ridges (Wilber 1910) (fig. 16-18).



Figure 13—East Fork looking downstream from Lot 11. Showing burned area in center of timber body.

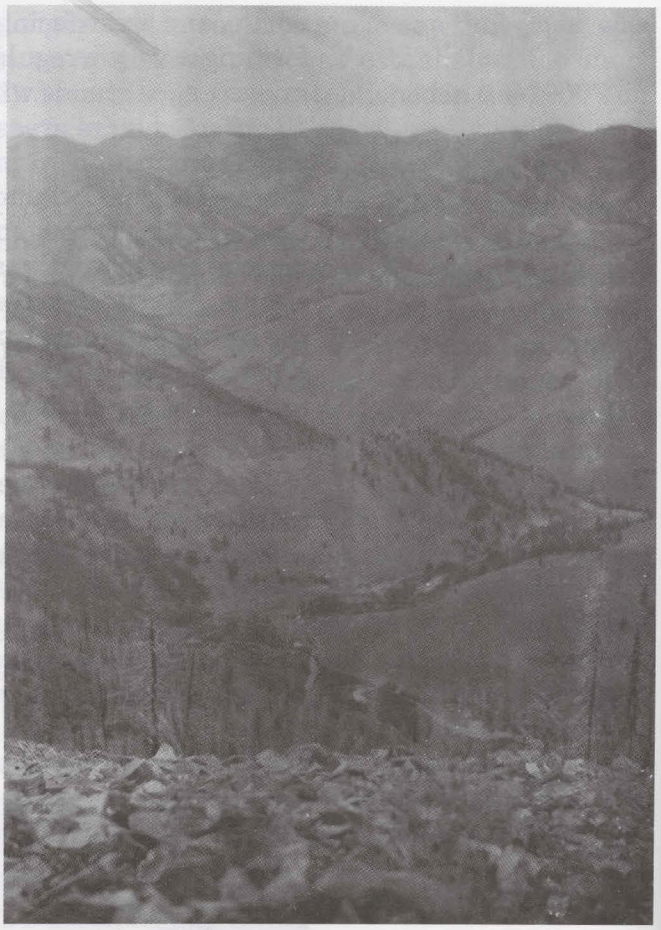


Figure 14—Warm Springs Creek above the upper Hot Springs.



Figure 15—General aspect of Placer Creek, Warm Springs Creek. A type of stand distribution quite general.

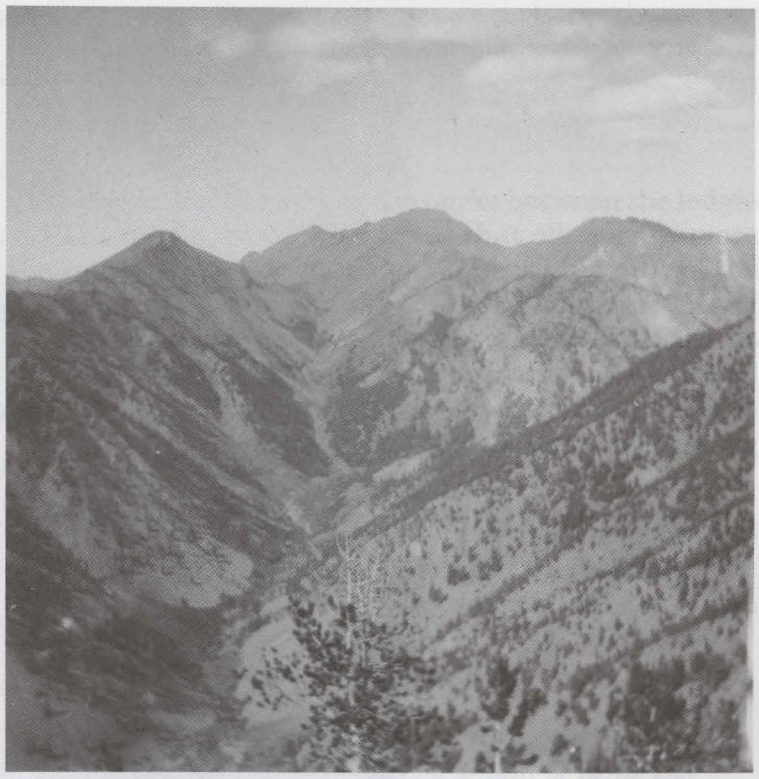


Figure 16—Head of the left fork of East Fork. Typical of the scattered timber and broken stand type.

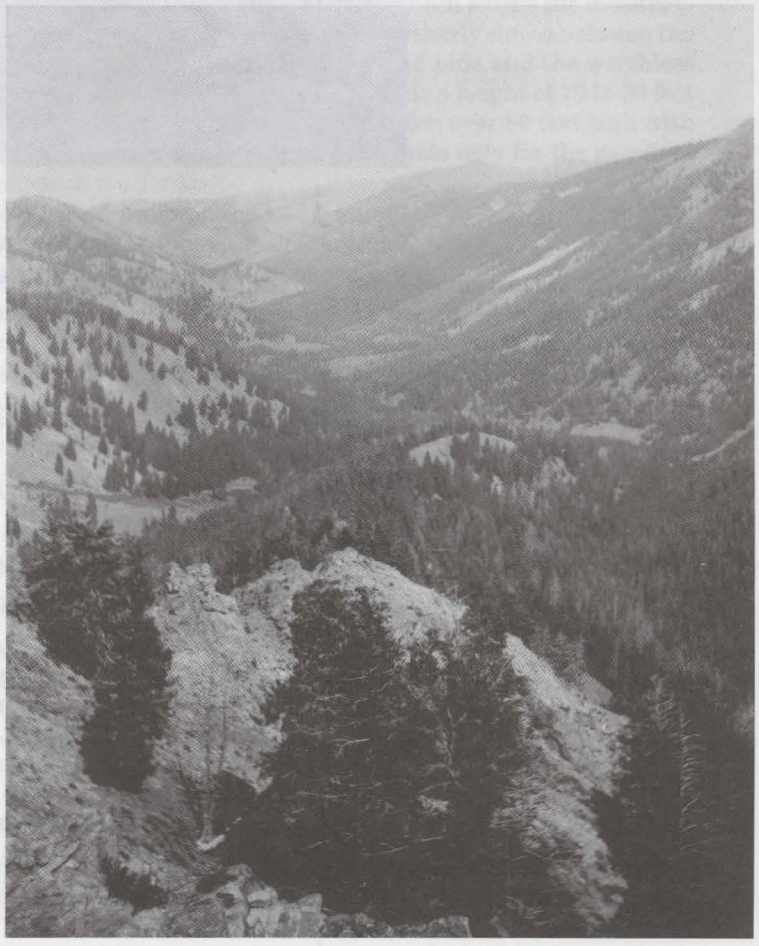


Figure 17—Baker Creek, looking downstream from the ridge between Appollo Creek and Brodie Gulch.

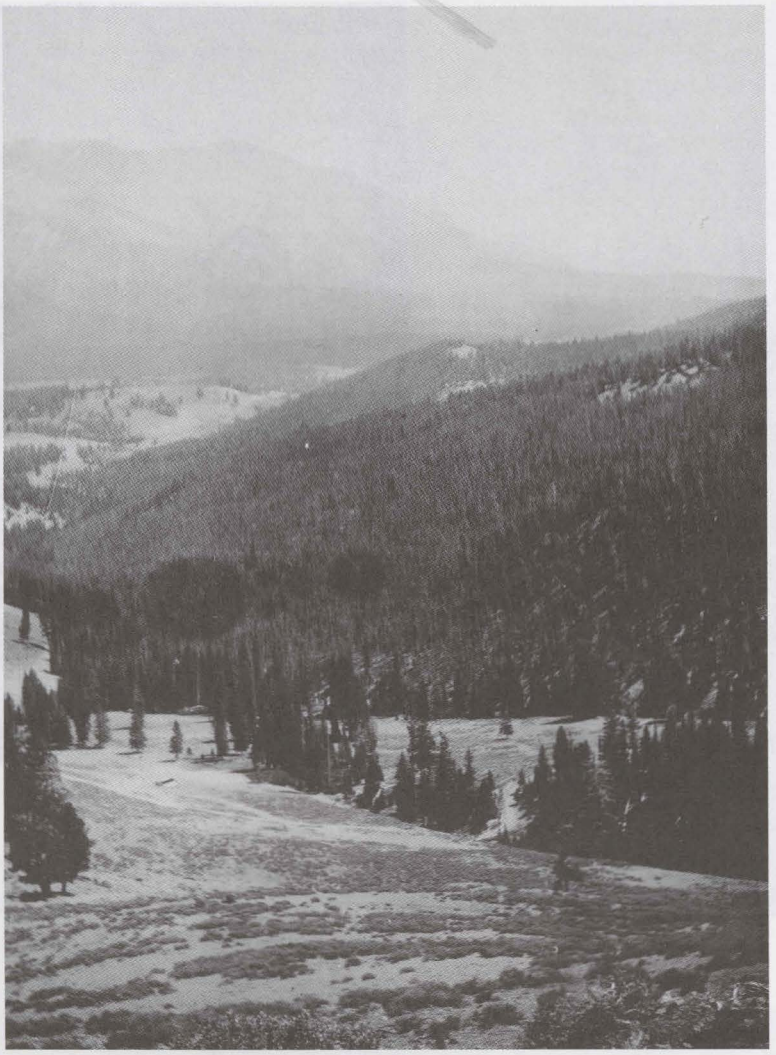


Figure 18—Looking down Main Wood River from the Galena Grade near the head, showing a continuous stand of small, defective fir and balsam.

Lodgepole pine was limited in numbers, but occurred throughout the watershed. Pure stands were confined to the lower slopes and bottoms. Its reproductive capability was strong; it was prone to taking over old burns and cut over areas (Wilber 1910).

Fire—On August 4, 1889 the Idaho Daily Statesman reported several fires were burning around Hailey and Ketchum.

> Tidings of raging forest fires continue to come in from every quarter. Yesterday Governor Shoup received a telegram that fires were raging on Deer Creek, Indian Creek, in the Warm Spring Creek Canyon and in the Sawtooth Mountains all about the upper Wood River towns. Should the present dry weather continue, there seems to be but little hope of stopping the ravages of these fires. Large forest fires have been burning for two weeks a few miles south of Ketchum. The fires are supposed to have started over near Willow Creek burning down Deer Creek taking the buildings around the mines, then getting over into Green River Gulch burning miles and miles of timber. There was danger for a while of the fire getting over the summit into the head of Basset Gulch, from there down Warm Spring Creek then

the Guyer Hot Springs, Philadelphia Smelter and the town would be in danger. There is a big fire over on Little Wood River that needs watching and fighting, it may get up into Elk Horn Gulch and over near town.

Targhee National Forest

Grazing—During the presettlement period, the parks between the lodgepole stands in Island Park were covered with grass that often grew more than 2 feet high on the southern end of the caldera. The rolling hills of the Rexburg Bench were covered with excellent grasses and relatively free of sagebrush. Pierre's Hole was known for its abundant grass. Two visitors to Island Park in the mid 1880's wrote to a newspaper in Butte and described the area as "...a fine country full of picturesque scenery and the grass is as high as a table. There are thousands of tons of the best hay imaginable going to waste there every year" (Valora 1991).

Red Rock Range—In 1906, A.T. Boisen and J.G. Peters surveyed the Red Rock Range (Henrys Lake NF) and wrote a management plan for the Forest. Table 21 and the following excerpts describe the condition of the Forest (Peters and Boisen 1906):

Alpine Land

The alpine land is found on the higher elevations, usually above 7,500 feet and at somewhat lower elevations on northerly slopes. The growth of herbs and grasses is comparatively luxuriant where the slopes are not too steep and the land is not too rocky and barren, and such flowers as phlox, columbine, spring beauty, and dogtooth violet are common. The characteristic forest is an open "park forest" composed of alpine fir, whitebark pine and on the northern slopes the moisture-loving Engelmann spruce. The best growth is on the northerly slopes between the elevations of 7,500 and 8,800 feet. Here the spruce and pine and the worthless alpine fir occur often in dense stands. The spruce attains a height of 70 to 80 feet with a diameter of 15 to 18 inches, while the pine is often over 60 feet high with a diameter of 12 to 15 inches. The alpine land is valuable only for the excellent summer pasturage which it affords.

Douglas-fir Land

This type occurs in a belt below the alpine land between the elevations of 6,500 and 7,800 feet. The original forest has been largely destroyed by fire and large areas are now occupied by lodgepole pine and by chaparral and popple. Within the Douglas-fir type two site qualities are distinguished (Quality I & II). Within each site quality the following subtypes are distinguished:

	Area
1. Douglas-fir stands	
a) Dense	925 acres
b) Broken	2,432 acres
c) Open	3,256 acres
d) Second growth	314 acres
2. Brushland	6,490 acres
3. Lodgepole stands	
a) 130 years old	1,608 acres
b) 80 years old	716 acres
c) 40 years old	1,156 acres
d) Uneven-aged	2,584 acres

Douglas-fir Stands

The Douglas-fir tends to occur in pure stands, though mixtures with lodgepole in Quality I and with alpine fir and lodgepole in Quality II are common. Douglas-fir

Table 21—Number of trees per acre in each diameter class by cover type for the Red Rock Range (Targhee National Forest) in 1906 (Peters and Boisen 1906).

Block	Compartment	Type	Area	Douglas-fir				Lodgepole pine	
				1-6	7-11	12-17	18+	1-8	9+
			Acres	*Inches*					
Arange	1	Dense Douglas-fir	97	53	15	23	21	58	8
		Open Douglas-fir	17	23	2	4	14	50	21
	2	Dense Douglas-fir	152	77	11	13	20	97	15
		Open Douglas-fir	82	24	9	8	9	55	7
		Cutover Douglas-fir	76	70	14	5	7	11	3
		Lodgepole	33						
	3	Dense Douglas-fir	134	32	12	24	22	30	7
		Broken Douglas-fir	186	12	8	15	16	31	7
		Open Douglas-fir	78	33	9	5	7	13	8
		Broken Douglas-fir	98	53	10	17	18	30	15
		Open Douglas-fir	24	22	4	4	7	1	2
		Cutover Douglas-fir	125	21	12	7	9	15	8
	4	Dense Douglas-fir	17	19	17	31	32	2	1
		Open Douglas-fir	8	33	9	5	7	13	8
		Broken Douglas-fir	172	38	11	13	18	14	6
		Dense Douglas-fir	34	18	22	27	14		6
		Open Douglas-fir	100	19	10	10	10		16
		Broken Douglas-fir	78	26	13	16	17	4	5
		Cutover Douglas-fir	31	21	12	7	9	15	8
		Lodgepole/Douglas-fir	173	34		3	4	73	46
	5	Dense Douglas-fir	13	35	10	25	26	17	12
		Broken Douglas-fir	164	29	12	11	14	18	8
		Open Douglas-fir	91	27	10	7	9	19	6
		Open Douglas-fir	24	19	10	10	10		16
		Lodgepole/Douglas-fir	400	24	5	1	1	72	67
	6	Dense Douglas-fir	42	35	10	25	26	17	12
		Broken Douglas-fir	67	17	8	11	20	36	22
		Open Douglas-fir	114	14	6	10	14	25	23
		Broken Douglas-fir	18		4	15	13	4	22
		Open Douglas-fir	30	6	6	13	12		7
		Lodgepole/Douglas-fir	210	24	5	1	1	72	67
	7	Broken Douglas-fir	41	33	9	19	25	1	2
		Open Douglas-fir	516	26	11	9	11	5	5
		Open Douglas-fir	186	9	5	7	15	1	2
		Lodgepole/Douglas-fir	202	24	5	1	1	72	67
	Block total		3,833	950	316	402	459	871	535
Sawtelle	2	Broken Douglas-fir	135	21	14	17	18	5	15
		Open Douglas-fir	53	5	5	12	11	4	3
		Broken Douglas-fir	15	17	15	13	15	32	40
	3	Dense Douglas-fir	22	44	6	14	30	11	13
		Broken Douglas-fir	275	21	10	15	18	28	13
		Open Douglas-fir	54	27	5	3	12	23	16
		Broken Douglas-fir	6	17	15	13	15	32	40
		Lodgepole/Douglas-fir	163	24	5	1	1	72	67
		Lodgepole	124						
	4	Broken Douglas-fir	14	13	2	7	21	148	16
		Dense Douglas-fir	162	19	8	19	23	17	13
		Broken Douglas-fir	16	37	7	14	9	18	45
		Open Douglas-fir	78	10	1	4	13	17	12
Flat Rock	2	Broken Douglas-fir	104	10	5	7	12	1	7
		Open Douglas-fir	36	12	2	6	8	14	2
		Lodgepole/Douglas-fir	58	3	1	1		219	112
		Dense Douglas-fir	68	44	10	24	18	22	21
		Open Douglas-fir	55	6	3	7	5	248	10
		Dense/Open Douglas-fir	26	38	10	21	14	98	4
		Open Douglas-fir	8	12	2	6	8	14	2
		Lodgepole/Douglas-fir	20	6	1	7	4	29	123
		Lodgepole	836						
	Block total		1,211	386	127	211	255	1,052	574

(con.)

Table 21—Con.

Block	Compartment	Type	Area	Douglas-fir				Lodgepole pine	
				1-6	7-11	12-17	18+	1-8	9+
			Acres	*Inches*					
Icehouse	1	Open Douglas-fir	244	18	6	9	13		3
		Dense Douglas-fir	60	20	8	17	17	4	5
		Open Douglas-fir	128	18	4	6	12		3
		Lodgepole/Douglas-fir	190	24	6	1	1	72	67
	2	Open Douglas-fir	316	18	9	7	13		2
		Open Douglas-fir	84	19	8	8	13	1	21
	3	Open Douglas-fir	60	22	22	9	12		
		Dense Douglas-fir	58	19	11	23	26		14
		Open Douglas-fir	108	33	13	10	12		2
		Lodgepole/Douglas-fir	10	24	5	1	1	72	67
	Block total		1,358	215	92	91	120	149	184
Sheridan	1	Broken Douglas-fir	252	70	17	19	16	2	11
		Broken Douglas-fir	28	70	19	22	13		
	2	Dense Douglas-fir	32	49	35	42	29	1	4
		Broken Douglas-fir	208	78	25	17	13	7	36
		Open Douglas-fir	46	111	23	16	13		10
		Second growth DF	168	84	42	21	6	1	2
		Lodgepole/Douglas-fir	29	42	12	16	6	10	64
	3	Dense Douglas-fir	8	35	40	65	35		10
		Broken Douglas-fir	244	66	26	20	15	6	21
		Open Douglas-fir	66	74	21	10	12		
		Second growth DF	100	93	68	30	4		5
		Broken Douglas-fir	168	33	23	21	16		3
		Second growth DF	46	30	35	19	3		
		Lodgepole/Douglas-fir	44	42	12	16	6	10	64
	Block total		1,439	877	398	334	187	37	230
	Stand total		2,797	1,092	490	425	307	186	414

is usually dominant in any stand in which it occurs. The dense stands are usually even-aged and the broken and open stands many-aged. The open stands are composed of open-grown trees that tend to occur in clumps. The merchantable Douglas-fir varies in age from 100-300 years. Some of it is badly injured by fire and much of it is mature. The characteristic undergrowth in the Douglas-fir stands is a scattering of spiraea, snowberry, and huckleberry, with a ground cover of grass and weeds. In the openings are patches of chaparral, popple, mountain ash, and on the southern slopes, sagebrush. Douglas-fir frequently attains a height of 120 feet with a diameter of over 35 inches.

Brushland

This land is usually covered by a dense growth of chaparral (*Ceanothus velutinus*) about four feet high with popple thickets here and there and often a scattering of Douglas-fir or lodgepole. On the drier and steeper slopes there is often nothing but a little grass and sagebrush. Most of the land was originally occupied by a Douglas-fir forest, as is shown by numerous charred stubs and fallen logs, and most of it will in time be occupied by Doulgas fir again, but the process will at best be a slow one. Where scattering seed trees are present reproduction has usually already started under the chaparral and popple, both of fir and lodgepole.

Lodgepole Stands

The lodgepole is practically coextensive with the Douglas-fir in this type. Its presence on Douglas-fir land is usually the result of fire. That it has replaced an original Douglas-fir forest is in many cases clearly shown by fallen fir logs and scattering fir trees. The good reproduction of Douglas-fir underneath the

lodgepole, and the fact that in size, longevity, rate of growth, and tolerance the fir surpasses the lodgepole, indicates that in any situation where the conditions are favorable to it, the fir will ultimately take possession again.

The ground cover differs somewhat from that on the lodgepole land. The red-berried blueberry and the pinegrass are still characteristic. Bearberry is usually absent altogether. Popple is common in the openings.

Lodgepole Land

This area embraces the level land bordering on the Henrys Lake Bottom. It is covered for the most part with dense even-aged stands of lodgepole. There is no Douglas-fir present and the dead timber on the ground indicates that the present stand has replaced a former stand of lodgepole. It is probable that this land has always supported a lodgepole pine forest and it may not be suitable for Douglas-fir. The lodgepole is rarely over 75 or 80 feet high and 12 to 14 inches in diameter. The open places are usually occupied by popple and sagebrush. Four classes of lodgepole stands are distinguished:

130-year-old stands	993 acres
80-year-old stands	2,091 acres
40-year-old stands	1,355 acres
uneven-aged	1,175 acres

The 130-year-old stand is a dense even-aged forest, the result of a fire some 130 years ago. Here and there are openings with a few scattering trees, probably the result of a second burning over, and in these openings an understory of younger lodgepole about 40 years old. The trees will average from 65 to 70 feet in height with an average diameter of about 9 inches, and a range in diameter 6 to 13 inches. In places the stand is very dense and the trees are consequently stunted. There are many catfaced and limby trees present.

The 80-year-old class consists of even-aged stands 60 to 80 years old. In height the trees will average 40-50 feet and in diameter from 4-6 inches.

The 40-year-old class is composed of a distinct 40-year age class. It is usually quite dense, almost impenetrable sometimes. The height averages about 25 feet and the diameter about 3 inches. In patches the trees are less than 5 feet in height and 1 inch in diameter.

The uneven-aged stands are composed chiefly of open-grown trees of various ages. The openings are occupied by popple and sagebrush.

The characteristic ground cover under the lodgepole is a thick carpet of pinegrass and red-berried blueberry [*Vaccinium scoparium*], with a good deal of bearberry [*Lonicera involucrata*] in places.

Fire

Originally all the mountain slopes between 6,000 or 6,500 and 7,800 feet were probably occupied by a Douglas-fir forest. Of this, only remnants are left. Most of this area is now occupied by chaparral or sagebrush wastes, or by lodgepole whose wide distribution in this region is to be attributed directly to fire. There is little doubt that most of this damage was due to crown fires which swept over large areas killing whole forests outright. Ground fires have probably occurred in greater number, but their effects have been rather indirect. The Indians in their wars and hunting are probably chiefly to blame, as this region seems to have been a favorite resort of theirs. It is the general opinion that in recent years the sheepmen have started a large number of fires, either through carelessness or in order to improve the pasturage.

Reconnaissance of the Targhee National Forest—This survey was completed in 1910, and included the portion of the Forest west of the Tetons and that part of the Continental Divide extending from Sawtell Peak to the extreme western end of the Forest (Dunston 1910).

The primeval forest of this region was predominantly composed of Douglas-fir stands and judging from the dense cover of aspen, chaparral, serviceberry and other shrubby growth and also from the excellent reproduction existing over huge treeless or almost treeless tracts, the original forest was very heavy and probably contained trees of splendid proportions. In Island Park, the great level or gently rolling lava plain, bordering the North Fork of the Snake River on both sides, the primeval forest was as it is now, composed almost exclusively of lodgepole.

Within the period white men have known this region, the forested areas have been to a greater or less extent in their present depleted condition. This condition is due almost entirely to the terrific forest fires which undoubtedly for centuries have been allowed to sweep unchecked over the plains, hills and mountains of the region.

Douglas-fir Type

At the lower elevations of its range, fir usually forms very open stands of mature or overmature trees growing over an extremely dense cover of chaparral, quaking aspen, chokecherry, serviceberry and willow. At altitudes from 6,000 to 8,000 feet, fir grows in mixture with lodgepole on areas where it is evident that the fir once formed pure stands. Fires are the chief cause of the poor condition of fir stands and of the exclusion of fir from many thousand acres of hill land now densely clothed with brush. Fair to excellent fir reproduction occurs in almost all localities where fir standards are scattered through pine stands. Undoubtedly, after many big forest fires which have destroyed all except the very old thick barked firs, fir reproduction has come in simultaneously with the pine.

Lodgepole Pine Type

The largest trees are found on the deep, rich soil of the buttes in Island Park or the hills bordering Island Park where fir has been eliminated by fires, or occurs only scatteringly. On the high rolling plateau country east of Big Springs and Warm River, pine is found in heavier and better stands than on any other part of the Forest. Throughout the entire extent of Island Park there are only a few small tracts of fir which invariably are found on the low buttes where better soil conditions exist than those prevailing on the surrounding level lava plain. The majority of the forest in Island Park is immature. Sapling stands usually occur in dense patches varying in size from one or two to several hundred acres. Stands of poles or mature trees are usually very open. Within the lodgepole forest of Island Park, there are a great many naturally treeless areas varying in size from a few to one or two hundred acres. These areas are covered with rushes, sedges, and flags.

Engelmann Spruce

This type ranges from 6,500 to 9,000 feet in the mountains of the continental divide and the Teton Range. Near the headwaters of Tyghee Creek there are spruce stands in which many mature trees are more than 40 inches in diameter at breast height and from 120 to 140 feet in height. On sites where spruce attains its best development, it usually occurs in pure or nearly pure stands sometimes growing with a small mixture of alpine fir.

Alpine Type

This type occurs from the upper limits of the spruce type to timberline. Alpine fir is the chief constituent of the type while limber pine [whitebark??] and occasionally gnarly Douglas-fir and spruce enter into the mixture. The alpine type does not form extensive forest cover in any part of the Forest. Large grassy or brush covered areas alternate with timbered patches.

Brush Type

Brush cover, as a rule, occurs on Douglas-fir land where repeated fires have finally destroyed all or almost all of the fir. *Ceanothus velutinus* probably occurs more extensively than any other brush. In the gulches and on the slopes on the

south side of the Great Bend Ridge, chaparral grows in dense large patches over many thousand acres. Very frequently excellent seedling growth of Douglas-fir exists under chaparral in this part of the Forest.

Block I

Almost all of this block is potential fir land. The land close to the Forest Boundary probably has never supported a close stand of fir, owing to the semi-arid climatic conditions prevailing there. On the northerly exposures and in the gulches and ridges for a distance of one to three miles south from the Great Bend Ridge, it is likely that originally a very good forest of fir existed. This conclusion is reached because of the individual firs scattered or in clumps; because of the dense growth of aspen, chaparral, willow and other brush; and because of the excellent seedling and sapling growth occurring in large patches over many hundreds of acres. Along the top of the Great Bend Ridge and for a short distance south of this ridge, lodgepole occupies the major part of the land occurring usually in immature stands. Scattered through these lodgepole stands along and close to the Great Bend Ridge are usually a few very large Douglas-firs, the survivors of many forest fires.

At the time of settlement, the rolling hill land to the north of Marysville contained a great deal of excellent Douglas-fir growing in open stands. During the past decade, the greater part of this area has been exploited of sawtimber. Logging operations are being carried on there at present, and within another year practically all the country in this locality will have been logged over. The hills once covered with Doulgas fir stands are now clothed with a dense growth of chaparral. Beneath and coming up through the brush is an excellent growth of fir seedlings and saplings.

Within the area tributary to Rattlesnake Canyon there has been considerable cutting chiefly for building timbers, poles, posts and firewood. Fires have burned over this locality so frequently in years past, the stand is very open and chiefly mature and overmature. At the lower altitudes where the slopes are almost entirely brush covered, fir reproduction is found beneath and crowding up through the brush.

The eastern exposures in Snow Creek canyon are covered with a dense growth of chaparral, aspen and other brush. Lodgepole sapling and pole stands grow at the heads of the forks of the canyon. A sawmill located a short distance below the Forest boundary has cut about 65% of the original stand of fir sawtimber.

Practically all the bodies of merchantable timber tributary to Pine Creek have been cut over. Before the drainage was exploited, a very good cover of fir was present in most of the gulches. The slopes are now mainly brush covered except toward the gulch heads where lodgepole has often encroached on the fir land in dense young stands, and where good bodies of pole and sapling fir exist. All the heads of the gulches west of Pine Creek are covered with small pole and sapling lodgepole stands. The area south and southeast of Antelope Flat has been cut and logged. Fires have reduced the representation of fir, while lodgepole and brush have acquired possession of the greater part of the ground.

Block II

This block includes the land sloping toward Antelope Flat from the north and east. The country west of Antelope Flat is almost entirely brush covered and contains clumps of young Douglas-fir and lodgepole pine. The slopes due south and also east of Antelope Flat are covered chiefly with immature lodgepole stands and with large areas of chaparral, willow and aspen. Fir and lodgepole occurs on the south side of the range which separates the Shot Gun Valley drainage from the Sand Creek drainage. The fir occurs in patches and often in very open stands on brushy slopes or scattered through lodgepole stands.

Block III

Originally, Douglas-fir grew over a larger percentage of the area in these hills than it presently occupies. Frequent fires have caused the advance of lodgepole in

this as well as most localities on the Targhee. The lodgepole type borders open Shot Gun Valley and extends up the slope of the range for distances varying from one quarter to one and a half miles. The fir type covers a very irregular strip of land above the lodgepole type extending upward to the rolling plateau land where pine again occupies the greater part of the area. Several gulches lying south of Bishop's ranch contain a great deal of excellent large fir [fig. 19].

Block IV

This block is entirely within Island Park. Originally lodgepole occurred in pure stands over almost all of Island Park. The few low buttes which are scattered throughout the park have always been natural Douglas-fir sites. It seems probable that the occurrence of lodgepole is due to poor drainage conditions. Judging from the remnants of mature stands which withstood the fires and also from the prostrate dead trees, mature stands of lodgepole have usually been open. The characteristic stand in Island Park is very open and patchy. It is probable that for several hundred years fires have at frequent intervals burned through. Approximately 70% is covered with immature forest. There are no extensive tracts of mature forest, but instead it occurs in isolated patches which have escaped the fires [fig. 20].

Block V

This block is that part of the continental divide which lies south and east of Red Rock Pass. Spruce forms the bulk of the stand and is superceded by limber pine and alpine fir toward the upper limit of tree growth and by Douglas-fir and lodgepole near the base of the range. Some very dense patches of good poles and sawtimber occupy the steep slope immediately south of Duck Creek. The low country about Red Rock Pass is chiefly covered with dense sapling and small pole stands of lodgepole and Douglas-fir. The southerly exposed slopes facing Duck Creek are covered with brush and a sprinkling of Douglas-firs. The very steep slope facing Henry's Lake and extending from Reynolds Pass to Tyghee Creek is covered by very small patches of Douglas-fir in several of the gulches [fig. 21].



Figure 19—Looking south from Shot Gun Valley. Note the sharp line of division between the wooded slope and the sagebrush flat.



Figure 20—A typical south slope in the hills bordering Island Park on the west, showing the very scattered stand of fir and dense cover of aspen chaparral.



Figure 21—Very open Douglas-fir stand on slope prevailingly covered with aspen; west edge of Henry's Lake Bottom near Red Rock Pass.

Block VI

The Block includes all of the drainage basin of Tyghee Creek. The spruce type is the most important within this block and this tree forms the great bulk of the merchantable stand. In the country close to the Forest Boundary and near the Targhee Pass the hills are chiefly covered with chaparral and sagebrush, although there are many patches of inferior fir and lodgepole. Most of the country is sparsely covered with stunted limber and whitebark pines and alpine fir. The bulk of merchantable timber occurs in one large tract beginning at a point about five miles above the Forest boundary and extending along the creek bottom and covering the easterly exposed slope of the south fork of Tyghee Creek for a distance of about two miles. An excellent body of spruce also occurs on the north fork of this creek extending upward from the forks for a distance of two miles. Within these tracts spruce reaches the finest development which is known for any part of the Forest. Trees 40 inches at d.b.h. and from 120 to 140 feet in height are not uncommon.

Block VII

Several small streams traverse this country flowing into Henry's Fork. Douglas-fir and Engelmann spruce are found most commonly in mixture. Lodgepole pine usually occurs in small pure patches throughout the mixed fir and spruce stands. Occasionally, alpine fir and limber pine enter into the mixture. Spruce covers a greater percentage of the block in pure stands than any other species. It seems probable that originally the Douglas-fir type predominated. Close to the divide, the forest becomes very open. A great deal of the area for a distance of from one and one half to two miles west of the divide contains a brush cover with a patchy stand of inferior alpine and Douglas-firs and a small percentage of spruce and limber pine. More than half of the merchantable timber is within the drainage basin of the creek which rises in Sections 15 and flows through Sections 10, 9, 8, 17 and 18, T. 15 N., R. 44 E. The bulk of the timber in this tract is Engelmann spruce which grows in close stands.

Block VIII

This block includes the portion of Island Park lying east of the Snake River. North of the Buffalo River there are no extensive bodies of merchantable timber. The butte in Sections 24 and 25, T. 12 N., R. 43 E. contains a very open stand of mature fir with scattered clumps of poles and in places fairly good reproduction. The stand on the butte in Sections 14 and 22, T. 11 N., R. 43 E. is considerably better than that on the previously mentioned butte.

Block IX

This block comprises the area between Yellowstone National Park and Island Park. The westerly exposed slope of the low range lying east of Big Springs and the Moose Creek meadows is mostly covered with young lodgepole stands. There are several small patches of mature fir scattered over this slope. The plateau which extends from the top of the low ridge bordering Island Park on the east into Yellowstone was covered with lodgepole type. In Black Canyon there is a large area of mature and overmature lodgepole. Over many acres, the average merchantable tree has an average diameter of 16 inches at breast height and a height of 90 feet. The rolling country south of Eccles between the ridge, forming the western border of the high plateau country, and the railroad, the forest is composed of extensive lodgepole stands interspersed with brush areas and open patches of large Douglas-fir. This country was originally almost entirely covered with Douglas-fir. Fires are responsible for the increased coverage by lodgepole.

Block X

The canyons of Fall River and Conant Creek are deep and have precipitous slopes, which are as a rule either rocky and barren or covered with brushy and non-commercial forest growth. The drainage basins of Rock and Wyoming Creeks in T. 9 N., R. 45 E. originally contained large tracts of excellent Douglas-fir. Fires destroyed the major part of these original stands, and the slopes are now covered

with a luxuriant growth of aspen and other brush. A great deal of excellent fir has been cut within the past few years from the Rock and Wyoming Creek drainages. Much of this cutting was done in very open mature stands. Lodgepole pine has encroached on the fir land. The major part of the block is covered with open inferior lodgepole stands. The open character of the forest in this locality is largely due to numerous fires in the past.

Block XI

Almost the entire block is comprised within the great plateau area which extends several miles eastward into Yellowstone. Only one large stream, Robinson Creek, completely traverses the block. This plateau has always been forested with lodgepole. These stands are typically even aged. In many instances, the mature trees are remnants of the stands which stood before the last great forest fire and that openings made in the original stands by fire have gradually become restocked. The last big fire occurred from 40 to 60 years ago. It swept over practically every acre of the block with the exception of the large tract of mature timber in the northern part. Mature trees in normal stands usually are from 60 to 90 feet high and from 12 to 16 inches at d.b.h.. In T. 10 N., R. 45 E., there are many large brush areas and sapling lodgepole stands often occur in mixture with aspen, willow and ceanothus. It is apparent that brush succeeded forest cover in many places at the lower altitudes after the destruction of the timber stands by fire, and that lodgepole and on some of the northerly exposed slopes Douglas-fir are steadily regaining possession of the ground.

Pinegrass, arnica, caryx, timber lupine, low bush huckleberry and huckleberry are the characteristic plants and shrubs forming the ground cover in lodgepole stands. In areas with deep, rich soils plants such as wooly weed, indian tobacco, indian paintbrush, fireweed, crowfoot, and five-finger are found. The ground cover in the brush and aspen areas is often very luxuriant and composed of excellent forage plants, wild oats, bulb grass [*Poa bulbosa*], red top [likely *Agrostis alba*], fireweed, large larkspur, and wild hollyhock [*Iliamnia rivularis*].

Block XII

This block lies entirely on the west slope of the Teton Range. It includes the area encompassing Lake of the Woods, Grassy Lake, Boone Creek, and Conant Creek. At altitudes ranging from 6,400 to 7,500 feet, Douglas-fir and lodgepole are the chief constituents. Above an altitude of 7,500 feet Douglas-fir drops out. Many large areas of pure lodgepole are found between 7,500 and 8,000 feet. Above 8,000 feet whitebark pine occurs in mixture with lodgepole, spruce, alpine fir and occasionally Douglas-fir. Close to the Teton Divide there are large pure stands of whitebark pine. Close to the divide and at elevations above 7,800 feet there are many small grassy brush covered areas.

Probably the last big fire occurred 30 to 40 years ago. There are many large areas covered with sapling lodgepole stands of about this age. Merchantable forest cover has been almost entirely destroyed on the slopes of South Boone and Conant Creeks. At the headwaters of both streams there are great areas of standing dead Douglas-fir and lodgepole poles which show that the forest cover existing there before was of excellent quality. The extensive brush areas on the slopes of the several branches of Boone Creek and Conant Creek contain a great many large Douglas-fir "stubs." Gradually, these brush areas are becoming restocked, but owing to the scarcity of seed trees and to the density of the brush cover in most places the reclamation of the land by forest growth will not be accomplished through natural regeneration before a great many years.

Palisade Reconnaissance—In 1914, the Elk Creek drainage (part of the old Palisade NF) was surveyed for possible timber harvest. Vegetative descriptions from the report follow (Lang 1914):

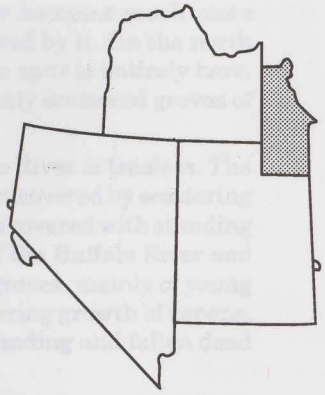
Elk Creek is divided by four principal tributaries as follows: Neeley Cove Fork, Sidoway Fork, Smokey Hollow Fork and the main Fork. Along the slopes of the main Fork close to the creek are Douglas-fir, lodgepole, alpine fir and some

scattered spruce changing to alpine fir and spruce near the head of the creek. The north slope of the creek is occupied principally by Douglas-fir, the lodgepole only extending a few chains along the slope. Most of the fir is 11 to 15 inches d.b.h. There are 30 to 40 alpine fir trees per acre at the higher elevations. The south slope is covered with an open short stand of Douglas-fir.

There is a small gulch coming into Smokey Hollow from the east just at the head of the canyon. This gulch is well timbered with spruce, fir and lodgepole. Above this the slopes are comparatively smooth and are well timbered with Douglas-fir, spruce, lodgepole, and alpine fir.

Charcoal Kilns—The charcoal kilns in the southern part of Lemhi County were part of the Salmon NF from 1938 to 1948, and now are part of the Targhee NF. C.H. McDonald, ranger on the Medicine Lodge RD, located the foundations of at least 42 kilns, and from old timers determined their period of use and average capacity (Smith 1969). He then calculated that about one and a half billion bdft of timber had been cut and used for charcoal production in that area.

Forty open pit type kilns were found scattered in the canyons and creeks of Italian, Irish, Scott, Eidleman, and Willow on the east side of Birch Creek, and Bell, Mammoth, Coal Kiln, Davis, and Meadow on the west side. These kilns could hold 40 to 50 cords of wood. Douglas-fir was preferred, though mountain mahogany was used at times (Smith 1969).



Wyoming Forests

Teton Forest Reserve—In 1897, Dr. T. S. Brandegee, botanist from San Diego, CA, devoted nearly 3 months to examining the Teton Forest Reserve and the southern portion of the Yellowstone Reserve. A report was prepared from his notes (Brandegee 1899):

> Most of the trees are young and small. It is only occasionally that tracts of timber of merchantable size are found, and areas containing notable quantities of merchantable forests are few and limited. This condition appears to be due simply and solely to fires which have swept over the country so completely and persistently that scarcely any part has been entirely exempt from them, while nearly all portions have been burned again and again within a generation. A large proportion of the area has been burned so persistently and frequently that the forests have ceased, temporarily, to attempt to restore themselves and these regions are now grass-covered parks. Some areas have been repeatedly burned so that lodgepole pine seems to have been driven out. Under present conditions the tree bearing regions as a whole decrease, while the aspen areas increase at the expense of those now producing conifers. With few exceptions young trees are springing up over the recently burnt districts and in most places are abundant. The young growth of lodgepole is usually very dense and even impassable. The timber of merchantable size is, for the most part, scattered over the reserve in small groves or individual trees. Only about 3% of the area of the reserve is covered by merchantable timber. If the entire area of 875 square miles were timbered as heavily as are these few areas, the reserve would contain about 1,000 million feet instead of 75 million. The difference between these numbers represents the destruction by fire.
>
> **Species of Timber**
>
> Lodgepole pine comprises ⅘ of the coniferous species. It is here a small tree, rarely 2 feet in diameter and 75 feet high. It covers large areas, to the exclusion of all other trees, and then its trunk is rarely more than 8-12 inches in diameter, although 50 to 75 feet high.
>
> Engelmann spruce is in some places abundant and seems to furnish most of the logs for the sawmills. A large tree may be 3 feet in diameter and 125 feet high.
>
> Red fir [Douglas-fir] isn't very abundant. It grows usually on dry ridges, and since much of it survives the fires it is probably more abundant than if the rest of the forest had not been destroyed. It is especially prominent on the west side of the Teton Range above Lee Creek. The largest trees are 3 feet in diameter and more than 100 feet high.
>
> Aspen, after lodgepole, is the most common tree. Large trees become nearly two feet in diameter and 50 feet high.
>
> Common juniper is very uncommon; only a bush seen now and then, perhaps two dozen altogether.

Very little of Juniperus virginiana is found. About Menirs Ferry some posts of it have been used about the ranch.

Limber pine grows in exposed situations, and rarely covers any area. There are some good sized forests south from Togwotee Pass. The species is usually common near the timber-line region, along the summit of ridges.

Subalpine fir is most abundant about the timber-line on northern slopes, and sometimes follows the streams down to the lowest elevations. The largest trees are 2-3 feet in diameter and 100 feet high.

Undergrowth

Lodgepole pine woods never have a very heavy undergrowth, and it is often entirely wanting. There is little humus in these forests. The most abundant vegetation growing under lodgepole is "pine grass," a grass not relished by stock. In moist situations *Lonicera* is common, with *Ribes, Sheperdia*, etc. Two or three species of shrubby *Artemisia* are very abundant in almost every place where there is no forest, but in the forest there is usually very little undergrowth of shrubs. The most abundant is *Vaccinium*, of two or three species, in the subalpine and middle elevations. *Elaeagnus* ia abundant along the stream banks of the lower elevations. Among the herbaceous plants that are valuable for pasturage or for hay, and are abundant, Geranium and *Helianthella* are the most important. *Ceanothus velutinus* is common east of Jackson Lake, north of Pacific Creek, on the east slope of the Teton Range, and west of the range. This bush is at times conspicuous on areas burned several years previous. *Sphaeraleea acerifolia* [*Iliamnia rivularis*], a showy malvaceous plant, soon appears in a burnt district, with *Epilobium* [*Epilobium angustifolium*], etc.

Detailed Description

T. 46 N., R. 111 W.- The undulating country of the western portion is covered by groves alternating with parks. Upon the lower slopes of the high mountain ridges there is scattering timber. The ridge rising in the southeastern portion of the township is well covered with forests.

T. 46 N., R. 112 W.- The slopes to Pacific Creek, in the northern part of the township, are fairly well timbered, while upon the drainage to Buffalo River, timber is scattering, occurring only in groves upon the north slopes, and contains much dead timber. There are two small recent burns in the north edge of the township.

T. 46 N., R. 113 W.- A large part of this township (about ⅓) has recently been burned. This burnt area is east of Pacific Creek. The slopes on the south side of the creek are fairly well timbered, and timber occurs in patches elsewhere. In the southwestern part of the township there is much quaking aspen and cottonwood, mingled with young pines in the valley of the creek. The northwestern part of the township contains scattered groves of young conifers, with much dead timber standing or fallen.

T. 46 N., R. 114 W.- Most of the area is devoid of timber. Some quaking aspen groves are found in the southern part and along the creek, while in the northwestern part are areas of small conifers. Three small recent burns have occurred in the NW portion of the township.

T. 45 N., R. 110 W.- The sides of the high plateau-like spurs are partially covered with forests, while the summits and upper portions of the slopes are bare.

T. 45 N., R. 111 W.- The spur south of the Buffalo River is fairly well timbered upon its north face, in small areas across its summit, and down the southern face. This timber is of commercial size and will cut over 2,000 feet per acre over an area equivalent to two sections. The western part of the township on spur south of the Buffalo River is a burn covering ~4-5 square miles. Much of the dead timber is still standing and is mainly Engelmann's fir. This is among the largest of this species seen upon the reserve, many trees being two feet in diameter and 100 feet high. If not killed by fire, this would have been one of the most valuable bodies of timber seen. On the southern slope of the spur, north of the Buffalo River and east of its North Fork, there is quite a body of timber, covering, perhaps, three-fourths of the

surface. Around on the west end of this spur the timber becomes much more scattering, only a small fraction of the surface being covered by it. On the north slopes again the timber becomes close, while the top of the spur is entirely bare. West of the North Fork the undulating country contains only scattered groves of timber.

T. 45 N., R. 112 W.- The immediate valley of the Buffalo River is treeless. The low, flat ridge separating it from Black Rock Creek is in part covered by scattering groves and in part by a burn of 4-5 square miles. This burn is covered with standing and fallen Engelmann's fir of merchantable size. North of the Buffalo River and east of Black Rock Creek the area is covered by scattered groves, mainly of young trees. The hill lying west of this creek is covered by a scattering growth of aspens, young pines, and a few red firs, with a large amount of standing and fallen dead timber.

T. 45 N., R. 113 W.- On the south of the valley there is a low bluff on which are scattered groves of aspen, and on the north the country rises into hills. On the east side of the township the slopes are covered with aspen groves and a scattered growth of young pines, with a few old red firs. Among this young growth many dead pines are still standing, while the ground is covered with others which have fallen. In the western side of the township there are a few scattered groves of pine; but most of the slopes of this hill, with the flat country north of it, have been recently burned. The summit is entirely devoid of timber.

T. 44 N., R. 112 W.- The township is covered with groves of conifers interspersed with open areas, the timber covering from one-half to two-thirds of the surface. The trees are all young, and among them is much dead standing timber, while the ground is thickly covered with fallen trees. There are two burns, one about three miles in length by one mile in width lying along the north bank of Elkhorn Creek and the other south of that stream comprising approximately two square miles.

T. 44 N., R. 113 W.- The Mount Leidy group of hills is timbered with conifers up to an altitude of about 10,000 feet. These are quite heavy on the north slopes, averaging 2,000 feet per acre over an area equivalent to four sections in this and the adjoining township on the west. North of Elkhorn Creek the high portion of the hills contains groves of conifers, covering perhaps one-half of the surface, while at the lower altitudes the timber changes into aspen groves.

T. 44 N., R. 114 W.- The northern slopes are covered quite densely by young lodgepole pines 15 to 20 feet in height, while in the southeast the trees reach merchantable size. The lower ground at the base of the slopes contains scattered groves of aspen, while the northern portion of the township includes the immediate valley and bottom lands of the Snake River and is open, with the exception of a belt immediately along the Snake River covered with cottonwoods and willows.

T. 43 N., R. 110 W.- One-third to one-half is timbered with groves of conifers, alternating with open parks.

T. 43 N., R. 111 W.- The slopes are sparsely timbered with groves of conifers. The valley of the creek is open, while immediately south of it, in the southern part of the township, the country is covered with aspen groves.

T. 43 N., R. 112 W.- The township is sparsely timbered, perhaps one-third of the area being covered with groves of conifers, interspersed with much dead timber. There are numerous small burns, especially in the western part of the township.

T. 43 N., R. 113 W.- This township is drained by the Gros Ventre River, which flows in a broad, open, timberless valley. Southeast of its valley are low hills with a few groves of conifers, while the northwest two-thirds of the township have hills that are sparsely covered with groves of conifers, about one-fourth of the area being wooded and the remainder parks.

T. 43 N., R. 114 W.- It is sparsely covered with scattered groves of conifers, covering perhaps one-fourth of the area, the remainder parks.

T. 42 N., R. 110 W.- The eastern half of the township is from one-half to three-fourths covered with coniferous timber, and the west half with scattered groves of aspens, covering perhaps one-third of its surface.

T. 42 N., R. 111 W.- South of the Gros Ventre the hills are similarly covered with scattered groves of conifers, changing into aspen in the northern and eastern portion of the township.

T. 42 N., R. 112 W.- South of the river there is very little timber, except in the southwest corner, which contains scattered groves of conifers. On the northern side the land rises gradually and is almost barren of timber, the lower slopes containing a little aspen, while higher up are scattered groves of coniferous trees.

T. 42 N., R. 113 W.- The hills to the north of the river are entirely treeless, with the exception of an area of one or two square miles in the northwest corner of the township. South of the river the land rises gradually into hills, the lower slopes of which are almost treeless, but higher up there is a dense growth of coniferous trees, which over an area of two sections in this township, average 2,000 feet or more per acre. The summit of the hills is treeless.

T. 42 N., R. 114 W.- North of the stream there is practically no timber. South the hills are very well timbered. Over an area of four sections some of the timber has been burned.

T. 42 N., R. 117 W.- This portion is covered with sage and grass. The mountains are almost treeless, with the exception of a few small groves of conifers on the lower slopes.

T. 41 N., R. 110 W.- The hills on each side of the Gros Ventre are fairly well covered with conifers.

T. 41 N., R. 111 W.- Large areas have burned recently.

T. 41 N., R. 112 W.- West of the creek are scattered groves of conifers, covering perhaps, one-half the area.

T. 41 N., R. 113 W.- The township contains very little timber, neither the slopes nor the summits of these plateaus being forested.

T. 41 N., R. 114 W.- The canyon walls are fairly well timbered. Elsewhere timber occurs only in small groves and bunches, while the summit of the plateau is everywhere bare.

T. 41 N., R. 115 W.- On Pollock Creek is a considerable body of good timber. Elsewhere timber only occurs in patches of small area and consists entirely of conifers.

T. 41 N., R. 117 W.- That part of the level valley lying between the river and Fighting Bear Creek contains scattered groves of lodgepole, Engelmann fir, with open parks and a little cottonwood. The western part contains patches of timber of some importance. One of these, three or four miles square, lies on the mountain spur. Another is on the south wall of East Pass Creek, where there is a sawmill engaged in cutting lumber for local consumption.

T. 40 N., R. 110 W.- This area is perhaps two-thirds covered by young pines.

T. 40 N., R. 111 W.- There is scarcely any timber.

T. 40 N., R. 112 W.- Half of the area is covered with groves of pine.

T. 40 N., R. 113 W.- There is no timber.

T. 40 N., R. 114 W.- There is no timber.

T. 40 N., R. 115 W.- The only timber contained is in a few scattered groves.

T. 40 N., R. 116 W.- The hills in the eastern portion are almost timberless, the forest consisting of scattered groves of trees.

T. 40 N., R. 117 W.- The western portion of the township is included in the Teton Mountains. The northeast slopes are fairly well timbered.

T. 40 N., R. 118 W.- There is no timber.

Hoback River Working Circle—In 1924, a management plan was developed for the Hoback River Working Circle. It was located in Hoback Basin, Townships 35 to 40 North and 111 to 115 West, approximately 30 miles southeast of Jackson. A small part of the working circle was included in the Wyoming NF. The working circle covered an area of 224,356 acres, part

T. 42 N., R. 111 W.- South of the Gros Ventre the hills are similarly covered with scattered groves of conifers, changing into aspen in the northern and eastern portion of the township.

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T. 42 N., R. 114 W.- North of the stream there is practically no timber. South the hills are very well timbered. Over an area of four sections some of the timber has been burned.

T. 42 N., R. 117 W.- This portion is covered with sage and grass. The mountains are almost treeless, with the exception of a few small groves of conifers on the lower slopes.

T. 41 N., R. 110 W.- The hills on each side of the Gros Ventre are fairly well covered with conifers.

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T. 41 N., R. 113 W.- The township contains very little timber, neither the slopes nor the summits of these plateaus being forested.

T. 41 N., R. 114 W.- The canyon walls are fairly well timbered. Elsewhere timber occurs only in small groves and bunches, while the summit of the plateau is everywhere bare.

T. 41 N., R. 115 W.- On Pollock Creek is a considerable body of good timber. Elsewhere timber only occurs in patches of small area and consists entirely of conifers.

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T. 40 N., R. 113 W.- There is no timber.

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T. 40 N., R. 115 W.- The only timber contained is in a few scattered groves.

T. 40 N., R. 116 W.- The hills in the eastern portion are almost timberless, the forest consisting of scattered groves of trees.

T. 40 N., R. 117 W.- The western portion of the township is included in the Teton Mountains. The northeast slopes are fairly well timbered.

T. 40 N., R. 118 W.- There is no timber.

Hoback River Working Circle—In 1924, a management plan was developed for the Hoback River Working Circle. It was located in Hoback Basin, Townships 35 to 40 North and 111 to 115 West, approximately 30 miles southeast of Jackson. A small part of the working circle was included in the Wyoming NF. The working circle covered an area of 224,356 acres, part

of which was privately owned, and had the following mature timber types (Wiesehuegel 1924):

Lodgepole pine	15,179
Spruce	4,455
Douglas-fir	8,191
Subalpine	2,076
Alpine fir	1,311
Total	31,212 acres

The Forest had mostly pure stands of lodgepole and spruce; in places there was a mixture of lodgepole and Douglas-fir, in addition to spruce and Douglas-fir. The spruce and Douglas-fir occurred on the higher slopes and the lodgepole was on the lower. The species composition was the following (Wiesehuegel 1924):

Lodgepole	31%
Spruce	28%
Douglas-fir	23%
Alpine fir	18%

In practically all stands of mature or overmature timber, there was a need for cutting, since most of the timber was infected with heart rot and trees appeared to be dying-out from overcrowding (Wiesehuegel 1924).

The foothill country was covered mostly with sage and aspen.

Star Valley Working Circle—In 1926, a management plan was written for the Star Valley Working Circle. Located next to the settlements in the upper and lower valleys, the circle was drained by the Salt River and its tributaries from the south and west. The Caribou NF contributed a large acreage of watershed but only a limited amount of timber (Farrell 1926).

The immediate bottom and foothill country was mostly immature aspen, grass, and sagebrush. As a whole, the Forest was composed of a mixed stand of Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir. Near the edge of merchantable timber, whitebark pine was found in limited quantities. The species were found in the following percentages over the entire area:

Douglas-fir	46%
Engelmann spruce	29%
Lodgepole pine	10%
Subalpine fir	15%

Timber harvest within the working circle started with the early settlement of the Star Valley in 1884. The nearby and easily accessible green and dead timber was culled over.

Conclusions

The information presented here represents a portion of the data that currently exist. Time constraints prevented checking libraries and historical societies in each State. Consequently, some Forests (especially the Challis) have very little information presented. Time constraints also prevented the collection of data illustrating the existing conditions of the areas where historical information was found. The reader will have to compare the

historical to the current condition. Past research has described the same vegetation conditions that were found in the historic documents presented here.

Rather than summarize all the information for each Forest, the most frequently noted themes will have been highlighted. The biggest changes occurred in Utah because settlement occurred earlier there than any other part of the Intermountain Region. The Mormon settlers arrived (approximately 1847-50) in large numbers, and brought livestock with the intent to spread across the Wasatch Front and into nearby canyons and valleys inside the Wasatch Mountains. They were responsible for the initial large-scale changes in nearly all the landscapes they touched. By the 1870's, the range was deteriorating. Sagebrush was rapidly increasing and gullies were common by 1890. Settlers could count the number of sheep bands by the dust clouds rising up from behind the hills.

Grazing took its toll on all rangelands in the Region. Ranges were grazed too early in the spring and too late in the fall. In addition to being grazed too long, the ranges were grazed too heavily. At the time the Forests were established, many ranges were in poor condition and the number of cows and sheep permitted to graze had to be reduced to restore the watersheds. Overgrazing significantly impacted the range by removing the fine herbaceous fuels; this prevented surface fires from spreading. This resulted in the accumulation of a deep litter layer in the frequent, low-severity fire regime, and the disruption of the fire cycle. Nutrient cycling and decomposition rates slowed significantly when fire was removed from these dry ecosystems.

The Region has lost a significant amount of seral aspen stands and meadows to the altered fire regime. Fire historically maintained the vigor of aspen clones and prevented conifer species from invading. Meadows were also maintained by frequent fire. Fire prevented conifer invasion and maintained a vigorous shrub and herbaceous layer. Many aspen stands and meadows have completely disappeared. Repeat photography (Boise National Forest 1993; Gruell 1983) has demonstrated this across the West.

Vegetation has changed significantly because of the marked reduction in acreage burned. Gruell's (1983) photo-retakes showed that the most striking change has been the widespread increase in distribution and density of conifers. In moist habitat types this has resulted in tree canopy closure and intensified competition with early successional herbs and shrubs. The change was subtle because it occurred slowly. The absence of fire in warm-dry and cool-dry forest and range habitat types allowed fire-sensitive shrubs, including big sagebrush, bitterbrush, and curlleaf mountain-mahogany, to increase (Gruell 1983).

Sloan (1994) conducted a stand history study on the Boise National Forest. He documented the changes in stand structure and composition in ponderosa pine stands from 1800 to 1993 in 50-year increments. He found that the Douglas-fir climax series of the 1800's generally supported 5 to 50 trees per acre of ponderosa pine. Heavy regeneration (mixture of ponderosa pine and Douglas-fir) following fire and timber harvests occurred between 1900 and 1930; in some cases, this resulted in over 900 trees per acre (Sloan 1994).

Land-use practices over the last 120 years altered the natural disturbance regime and reduced ecosystem resistance and resilience to disturbances

(Lehmkul and others 1994). Fire exclusion, timber harvest, and livestock grazing are among the management practices that have contributed to changes in ecosystem character (including simplification of forest stand structure and composition) that are conducive to insect outbreaks and severe wildfires (Agee 1993; Gast and others 1991; Hessburg and others 1993; Martin and others 1976). Cultural practices, including road building and development of irrigated pastures, broke fuel continuity. At the same time, Native American ignitions were eliminated by relocating tribes to reservations.

The disruption of natural fire cycles resulted in a decreasing fire frequency but increasing intensity of fires (Agee 1993; Covington and Moore 1994; Gast and others 1991). The greatest change in fire regimes following fire exclusion occurred in the nonlethal, frequent, low intensity fire regime (1 to 25 years). The historic fire regime was frequent enough to keep surface fuel loads low and thin out trees so that the canopy was separated both horizontally and vertically. Fire exclusion has allowed fuel accumulation, and understory saplings to establish under the overstory. These changes have shifted the fire regime from relatively small, light surface fires (nonlethal regime) to large, intense stand replacement crown fires characteristic of a lethal fire regime. There has been a rescaling of fire size as more patches of homogeneous fuels across the landscape reach a condition that will support crown fire.

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Appendix A—Plant Species Encountered During 40th Parallel Expedition, 1871

Species of the Wasatch and Uintas

Abies grandis
Acer grandidentatum
Acer negundo
Allium brevistylum
Allium macropetalum
Angelica lucida
Angelica pinnata
Antennaria margaritacea
Aplopappus haplopappus
Aquilegia caerulea
Aquilegia flavescens
Arctostaphylos patula
Arenaria capillaris
Arenaria congesta
Arenaria lateriflora
Arenaria rubella
Arnica latifolia
Artemisia filfolia
Artemisia scopulorum
Aster glaucus
Aster kingii
Astragalus jejunus
Astragalus spatulatus
Balsamorhiza macrophylla
Betula glandulosa
Betula occidentalis
Callitriche hermaphroditica
Calochortus gunnisonii
Camissonia breviflora
Campanula rotundifolia
Campanula uniflora
Carex bebbii
Carex brevior
Carex brunnescens
Carex buxbaumii
Carex capillaris
Carex concinna
Carex disperma
Carex geyeri
Carex haydeniana
Carex hoodii
Carex illota
*Carex lacinata**
Carex lagopina
*Carex limula**
Carex nigricans
Carex paupercula
Carex pyrenaica
Carex raynoldsii
Carex saxatilis
Carex scopulorum
Carex tenera
Carex vitilis
Castilleja flava
Catabrosa aquatica
Cerastium arvense
Cerastium fontanum
Cercocarpus montanus
Chimaphila umbellata
Chlorocrambe hastatus
Circaea alpina, var.
Cirsium scopulorum
Claytonia megarhiza
Clematis columbiana
Clematis hirsutissima
Clematis occidentalis
Corallorhiza maculata
Cymopterus longipes
Danthonia californica
Dichelostemma multiflorum
Disporum trachycarpum
Draba aurea
Dracocephalum parviflorum
Dryas octopetala
Eleagnus commutata
Erigeron acris
Erigeron arenarioides
Erigeron elatior or *E. speciosus*
Erigeron ochroleucus
Erigeron speciosus var. *macranthus*
Erigeron ursinus
Eriogonum brevicaule
Eriogonum corymbosum
Eriogonum racemosum
Eritrichium nanum
Erythronium grandiflorum
Euphorbia robusta
Floerea proserpinacoides
Fragaria vesca
Fragaria virginiana, var.
Galium trifidum
Gaultheria humifusa
Gentiana algida
Gentiana heterosepala
Gilia gunnisonii
Gilia stenothrysa
Gilia tenerrima
*Habenaria foetida**
Hedysarum boreale
Helianthella uniflora
Hieracium albiflorum
Hieracium gracile
Hierochloe odorata
Humulus americanus
Ivesia gordonii
Jamesia americana
Juncus drummondii
Juncus filiformis
Lathyrus brachycalyx
Lathyrus palustris
Lathyrus pauciflorus
Lewisia brachycalyx
Ligusticum apiifolium
Linnaea borealis
Linum kingii
Lithospermum incisum
Lomatium bicolor
Lomatium triternatum ssp. *platycarpum*
Lonicera utahensis
Lupinus argenteus var. *parviflorus*
Lupinus lepidus var. *aridus*
Lupinus leucophyllus
Luzula campestris
*Lychnis ajanensis**
Lychnis apetala
Lychnis drummondii
Lycopus americanus
Lysimachia ciliata
Madia glomerata
Mertensia brevistyla
Mitella trifida
Moneses uniflora
Navarretia minima
Nemophila parviflora
Nuphar polysepalum
Oenothera cornicopifolia
Orobanche uniflora
Orogenia linearifolia
Osmorhiza chilensis
Oxytropis campestris
Paronychia pulvinata
Parrya nudicaulis
Pedicularis bracteosa
Pedicularis racemosa
Penstemon angustifolius
Penstemon caespitosus
Penstemon cyananthus
Penstemon sepalulus
Penstemon whippleanus
Physalis pubescens
Pinus contorta, var.
Poa fendleriana
Poa grayana
Poa leptocoma
Poa palustris
Polygonum lapathifolium, var.
Polygonum minimum
Potamogeton alpinus
Potamogeton pusillus, var.
Potentilla nivea
Potentilla norvegica

* Indicates nomenclature error

Pseudotsuga menziesii
Ptelea trifoliata
Pterospora andromeda
Puccinellia pauciflora
Pyrola secunda
Pyrola virens
Quercus gambelii
Ranunculus flammula, var.
Ranunculus gmelinii
Ranunculus orthrorhynchus
Ranunculus pedatifidus
Rhus glabra
Rhus radicans
Ribes laxiflorum
Ribes viscosissimum
*Rosa fraxinifolia**
Rubus leucodermis
Rumex paucifolius
Sagina nivalis
Sagina saginoides
Salix arctica
Salix phlebophylla
Sambucus racemosa, var.
Saxifraga caespitosa
Saxifraga debilis
Saxifraga flabellaris
Saxifraga integrifolia
Scutellaria galericulata
Sedum rhodanthum
Senecio douglasii
Senecio eremophilus
Senecio fremontii
Sidalcea candida
Sparganium minimum
Sphaeromeria diversifolia
Stellaria borealis or *S. calycantha*
Streptopus amplexifolius
Synthyris pinnatifida
Taraxacum officinale
Taraxacum phymatocarpum
Tellima grandiflora
Thalictrum sparsiflorum
Tradescantia occidentalis
Trifolium andinum
Trifolium dasyphyllum
Trifolium gymnocarpon
Trifolium kingii
Trifolium nanum
Trifolium parryi
Triodanus perfoliata
Trollius laxus
Vaccinium membranaceum
Vaccinium myrtillus
Vaccinium uliginosum
Verbena bractata
Veronica serpyllifolia
Viola canadensis
Viola palustris
Zannichellia palustris
Zauschneria latifolia
Zigadenus fremontii
Zizia aptera

Mountain Species of the Basin

Abies grandis
Acer glabrum
Achillea millefolium
Aconitum columbianum
Actaea rubra
Agastache urticifolia
Ageratina occidentalis
Agrostis canina
Agrostis exarata
Allium acuminatum
Allium bisceptrum
Allium validum
Alnus incana, var.
Amelanchier canadensis, var.
Androsace septentrionalis
Anemone multifida
Angelica breweri
Antennaria alpina
Antennaria dioica
Antennaria pulcherrima
Apocynum androsaemifolium
Aquilegia canadensis, var.
Arabis drummondii
Arabis glabra
Arabis hirsuta
Arabis lemmonii
Arabis platysperma
Arenaria aculeata
Arenaria fendleri
Arenaria kingii
Arenaria nuttallii
Arnica angustifolia
Arnica chamissonis
Arnica cordifolia
Arnica longifolia
Arnica mollis
Artemisia arbuscula
Artemisia biennis
Artemisia discolor
Artemisia frigida
Asclepias fascicularis
Aster alpigenus
Aster campestris
*Aster douglasii**
Aster perelegans
Aster scopulorum
Astragalus agrestis or *A. adsurgens*
Astragalus atratus
Astragalus australis
Astragalus calycosus
Astragalus canadensis
Astragalus collinus
Astragalus convallarius
Astragalus filipes
Astragalus kentrophyta
Astragalus lentiginosus
Astragalus obscurus
Astragalus platytropis
Astragalus porrectus
Astragalus robbinsii, var.
Astragalus tenellus
Astragalus whitneyi
Balsamorhiza hookeri
Barbarea vulgaris
Berberis aquifolium
Brickellia californica
Brickellia grandiflora
Brickellia microphylla
Brickellia oblongifolia
Bromus ciliatus
Bromus marginatus
Brunella vulgaris
Calamagrostis purpurascens
Calochortus eurycarpus
Caltha leptosepala
Calyptridium umbellatum
Calystegia sepium
Camassia quamash
Camissonia subacaulis
Cardamine cordifolia
Carex affinis
Carex atrata
Carex frigida
Carex lanuginosa
Carex leporina
Carex muricata
Carex pachystachya
Carex petasata
Carex rossii
Carex scirpoidea
Carex scopulorum
Castilleja flava
Castilleja linariifolia
Castilleja parviflora
Ceanothus oliganthus var. *sorediatus*
Ceanothus velutinus
Cerastium nutans
Cercocarpus ledifolius
Cercocarpus montanus
Chaenactis douglasii
Chenopodium capitatum
Chrysothamnus parryi
Cirsium foliosum
Cirsium occidentale
Cirsium undulatum

* Indicates nomenclature error

Clarkia rhomboidea
Claytonia caroliniana, var.
Claytonia perfoliata
Claytonia umbellata
Clematis ligusticifolia
Collomia grandiflora
Collomia linearis
Collomia tenella
Comandra umbellata ssp. *pallida*
Cornus sericea
Corydalis aurea, var.
Crataegus rivularis
Crepis acuminata
Crepis occidentalis
Cryptantha celosioides
Cusickia douglasii
*Cymopterus anisatus**
Cymopterus glaucus
Cymopterus nivalis
Cymopterus terebinthinus
Delphinium depauperatum
Delphinium elatum, var.
Descurainia californica
Draba alpina
*Draba muricella**
Draba nemorosa
Draba nivalis
Dugaldia hoopesii
Elymus elymoides
Elymus trachycaulus
Epilobium alpinum
Epilobium angustifolium
Epilobium glandulosum
Epilobium obcordatum
Epilobium paniculatum
Ericameria bloomeri
Ericameria discoidea
Ericameria nana
Ericameria suffruticosa
Erigeron asperugineus
Erigeron bloomeri
Erigeron breweri
Erigeron compositus
Erigeron peregrinus var. *callianthemus*
Erigeron peregrinus
Eriogonum caespitosum
Eriogonum elatum
Eriogonum heracleoides
Eriogonum lobbii
Eriogonum microthecum
Eriogonum spergulinum
Eriogonum umbellatum
Eriogonum vimineum
Eriogonum kingii
Eriophyllum lanatum
Erysimum asperum
Erysimum cheiranthoides
Festuca ovina
Frasera speciosa
Fritillaria atropurpurea
Fritillaria pudica
Galium bifolium
Galium boreale
Galium multiflorum
Galium multiflorum
Galium triflorum
Gayophytum diffusum
Gayophytum racemosum
Gayophytum ramosissimum
Gentiana parryi
Geranium carolinianum
Geranium richardsonii
Geum rossii
Geum triflorum
Hackelia deflexa
Helianthella uniflora
Heracleum lanatum
Heterocodon rariflorum
Heuchera cylindrica, var.
Heuchera parvifolia
Heuchera rubescens
Hieracium scouleri
Holodiscus dumosus
Hydrophyllum capitatum
Hydrophyllum macrophyllum
Hymenopappus tenuifolius
Hymenoxys acaulis
Hymenoxys richardsonii
Hypericum mutilumi
Hypericum scouleri
Iliamnia rivularis
Ipomopsis aggregata
Ivesia baileyi
Juncus mertensianus
Juncus parryi
Juncus triformis
Juniperus communis, var.
Juniperus occidentalis
Juniperus scopulorum
Kalmia microphylla
Koeleria macrantha
Ledum glandulosum
Leptodactylon watsonii
Lesquerrella montana
Leucopoa kingii
Lewisia pygmaea
Lewisia rediviva
Ligusticum grayi
Limosella aquatica
Linanthastrum nuttallii
Linanthus liniflorus
Linanthus pygmaeus
Linum perenne
Listera convallarioides
Lithophragma parviflora
Lithophragma tenella
Lithospermum ruderale
Lloydia serotina
Lomatium foeniculaceum
Lomatium graveolens
Lomatium grayi
Lonicera involucrata
Lomatium nudicaule
Lupinus argenteus
Lupinus meionanthus
Lupinus polyphyllus
Lupinus sericeus
Lupinus sulphureus
Luzula parviflora
Luzula spicata
Machaeranthera canescens
Madia gracilis
Melica poaeoides
Melica stricta
Mertensia ciliata
Mertensia oblongifolia
Mertensia paniculata
Microseris linearifolia
Microseris nutans
Mimulus guttatus
Mimulus lewisii
Mimulus moschatus
Mimulus primuloides
Minuartia arctica
Mitella pentandra
Monardella odoratissima
Montia chamissoi
Nassella viridula
Navarretia breweri
Navarretia intertexta
Opuntia polyacantha var. *juniperina*
Osmorhiza occidentalis
Oxyria digyna
Oxytropis campestris
Pachystima myrsinites
Parnassia fimbriata
Pedicularis groenlandica
Pediocactus simpsonii
Penstemon confertus
Penstemon fremonti
Penstemon humilis
Penstemon kingii
Penstemon miser
Perityle stansburii
Petrophytum caespitosum
Phacelia hastata
Phacelia humilis
Phacelia sericea
Phleum alpinum
Phlox caespitosa
Phlox condensata
Phlox hoodii
Phlox longifolia
Phoenicaulis cheiranthoides
Physaria didymocarpa
Physocarpus malvaceus
Picea engelmannii
Pinus balfouriana
Pinus flexilis
Pinus monophylla

* Indicates nomenclature error

Pinus ponderosa
Platanthera dilatata
Platanthera hyperborea
Poa alpina
Poa sandbergii
Polemonium caeruleum
Polemonium confertum
Polygonum bistorta
Polygonum phytolaccaefolium
Polygonum spergulariaeforme
Polygonum viviparum
Populus balsamifera, var.
Populus tremuloides
Potentilla diversifolia
Potentilla fruticosa
Potentilla glandulosa
Potentilla pensylvanica, var.
Potentilla pulcherrima
Primula parryi
Prunus demissa
Prunus virginiana
Pseudoroegneria spicata
Pseudostellaria jamesii
Psorothamnus kingii
Purshia mexicana
Pyrola asarifolia
Pyrrocoma apargioides
Pyrrocoma racemosa
Ranunculus alismaefolius, var.
Ranunculus eschscholtzii
Ranunculus glaberrimus
Ranunculus jovis
Ranunculus macranthus
Ribes bracteosum
Ribes cereum
Ribes hirtellum
Ribes irriguum
Ribes lacustre
Rubus idaeus
Rubus parviflorus
Rudbeckia occidentalis
Rumex venosus
Salix glauca, var.
Salix reticulata
Sambucus cerulea
Saxifraga adscendens
Saxifraga nelsoniana
Saxifraga nivalis
Scirpus microcarpus
Scrophularia nodosa
Scutellaria resinosa
Sedum debile
Sedum roseum
Sedum stenopetalum
Senecio amplectens
Senecio andinus
Senecio aureus
Senecio canus
Senecio lugens, var.
Senecio triangularis
Shepherdia canadensis
Sibbaldia procumbens
Silene acaulis
Silene antirrhina
Silene douglasii
Silene menziesii
Silene nuda
*Sisymbrium junceum**
*Sisyrinchium grandiflorum**
Smelowskia calycina
Smilacina racemosa, var.
Smilacina stellata
Solidago guiradonis
Solidago multiradiata
Solidago stricta
Sorbus sitchensis
Sphaeromeria cana
Sphenopholis obtusata
Sphenosciadium capitellatum
Spiranthes romanzoffiana
Stellaria crassifolia
Stellaria longipes
Stellaria umbellata
Stenotus acaulis
Stephanomeria tenuifolia
Streptanthus cordatus
Swertia perennis
*Symphoricarpus montanus**
Thalictrum alpinum
Thalictrum fendleri
Thlaspi fendleri
Townsendia scapigera
Trifolium longipes
Trifolium microcephalum
Trisetum spicatum
Vaccinium caespitosum
Valeriana dioica
Veratrum californicum
Veronica wormskjoldii
Vicia americana
Viguiera multiflora
Viola beckwithii
Viola canina
Viola nuttallii
Wyethia amplexicaulis
Wyethia mollis

Aquatic and Meadow Species

Agrostis elata
Agrostis scabra
Aira caespitosa
Alisma plantago-aquatica
Alopecurus aequalis
Angelica kingii
Apocynum cannabinum
Arctostaphylos uva-ursi
Argentina anserina
Artemisia dracunculoides
Artemisia ludoviciana
Asclepias speciosa
*Aster aestivus**
Aster ascendens
Aster brachyactis
*Aster carneus**
Aster falcatus
Aster lanceolatus
Beckmannia syzigache
Bergia texana
Berula erecta
Calamagrostis stricta
Callitriche palustris
Camissonia tanacetifolia
Cardamine hirsuta
*Carex aemathorhyncha**
Carex atherodes
Carex athrostachya
Carex aurea
Carex douglasii
Carex jamesi
Carex lanuginosa
Carex praegracilis
Carex stipata
Carex utriculata
Carex vesicaria
Castilleja affinis
Catabrosa aquatica
Ceratophyllum demersum
Cicuta maculata
Cirsium drummondii
Conyza canadensis
Crassula aquatica
Crepis runcinata
Cyperus aristatus
*Cyperus phymatodes**
Deschampsia danthonioides
Dodecatheon meadia
Downingia pulchella
Echinochloa crus-galli
Elatine americana
Eleocharis acicularis
Eleocharis palustris
Elytrigia repens
Epipactis gigantea
Eragrostis pectinacea
Erigeron bellidiastrum
Erigeron glabellus
Erigeron lonchophyllus
Erigeron pumilus

* Indicates nomenclature error

Euthamia occidentalis
Galium mexicnum spp. *asperrimum*
Gaura parviflora
Gentiana affinis
Gentianella amarella
Gentianopsis detonsa
Geum macrophyllum
Glaux maritima
Glycyrrhiza lepidota
Gnaphalium luteo-album
Gnaphalium palustre
Gratiola virginiana
Helenium autumnale
Hesperochiron californicus
Heteranthera dubia
Hippuris vulgaris
*Hordeum pratense**
Iris tolmieana
Iva axillaris
Juncus balticus
Juncus bufonius
Juncus longistylis
Juncus nodosus
Juncus xiphioides
Lemna minor
Lemna trisulca
Lemna valdiviana
Leymus condensatus
Lotus purshianus
Mentha canadensis
Menyanthes trifoliata
Microseris nutans
Mimetanthe pilosa
Mimulus floribundus
Muhlenbergia andina
Muhlenbergia glomerata
Muhlenbergia sylvatica
Mulgedium pulchellum
Myriophyllum verticillatum
Nasturtium palustre
Oenothera biennis
Parietaria pensylvanica
Parnassia parviflora
Phalaris arundinaceae
Phragmites communis
Plantago eriopoda
Polygonum amphibium
Populus deltoides
Populus trichocarpa
Potamogeton filiformis
Potamogeton gramineus
Potamogeton natans
Potamogeton nodosus
Potamogeton pectinatus
Potamogeton perfoliatus
Potentilla gracilis var. *nuttallii*
Potentilla gracilis
Potentilla rivalis var. *millegrana*
Ranunculus aquatilis
Ranunculus fascicularis
Ranunculus repens
Ranunculus sceleratus
Ribes aureum
Rorippa curvipes
Rorippa curvisiliqua var. *lyrata*
Rorippa sinuata
Rosa blanda
Rotala ramosior
Rumex longifolius
Rumex maritimus
Rumex orbiculatus var. *borealis*
Rumex salicifolius
Sagittaria latifolia
Salix cordata
Salix exigua
Samolus valerandi, var.
Scirpus nevadensis
Scirpus torreyi
Scirpus validus
Senecio hydrophyllus
Shepherdia argentea
Sidalcea malvaeflora
Sisyrinchium angustifolium
*Sium lineare**
Solidago canadensis
Solidago gigantea
Solidago nemoralis
Sonchus asper
Sparganium eurycarpum
Spirodela polyrhiza
Sporobolus airoides
Stachys palustris
Stephanomeria exigua
Thermopsis rhombifolia var. *montana*
Trifolium cyathiferum
Trifolium variegatum
Trifolium wormskioldii
Typha latifolia
Urtica dioica
Urticularia vulgaris
Urtricularia minor
Valeriana edulis
Veronica americana
Veronica anagallis-aquatica
Veronica peregrina
Vilfa ramulosa
Viola cucullata
Zigadenus elegans ssp. *glaucus*
Zigadenus nuttallii

Species of Drier Valleys and Foothills

Abronia fragrans
Abronia turbinata
Achnatherum hymenoides
Acnatherum occidentalis
Agoseris aurantiaca
Agoseris grandiflora
Agoseris heterophylla
Allium anceps
Allium atrorubens
Allium nevadense
Allium tribracteatum
Amaranthus californicus
Amaranthus retroflexus
Amaranthus albus
Ambrosia acanthicarpa
Ambrosia artemisiifolia
Ambrosia psilostachya
Amsinckia lycopsoides
Androsace occidentalis
Anemone berlandieri
Anisocoma acaulis
Antennaria dimorpha
Arabis holboellii var. *retrofracta*
Arabis sparsiflora var. *arcuata*
Argemone mexicana
Aristida purpurea
Artemisia spinescens
Artemisia tridentata
Artemisia tripartita
Asclepias cryptoceras
Asclepias viridiflora
Astragalus andersonii
Astragalus beckwithii
Astragalus chamaeleuce
Astragalus filipes
Astragalus geyeri
Astragalus iodanthus
Astragalus kentrophyta
Astragalus lentiginosus
Astragalus malacus
Astragalus newberryi
Astragalus nuttallianus
Astragalus oophorus
Astragalus purshii
Astragalus serenoi
Astragalus speirocarpus
Astragalus utahensis
Atriplex canescens
Atriplex confertifolia
Atriplex torreyi
Atriplex truncata
Balsamorhiza hookeri
Balsamorhiza sagittata
Blepharidachne kingii
Blepharipappus scaber
Boisduvalia glabella
Brickellia linifolia

* Indicates nomenclature error

Burrielia spinosa
Calochortus nuttallii
Calyptidium roseum
Camissonia boothii
Camissonia contorta
Camissonia pterosperma
Camissonia scapoidea
Carum gairdneri
Castilleja pilosa
Castilleja tenuis
Caulanthus crassicaulis
Caulanthus pilosus
Celtis occidentalis
Cenchrus tribuloides
Chaenactis carphoclinia
Chaenactis macrantha
Chaenactis stevioides
Chaenactis xantiana
Chamaesyce glyptosperma
Chamaesyce ocellata
Chenopodium album
Chenopodium fremontii
Chenopodium simplex
Chorizanthe brevicornu
Chorizanthe rigida
Chorizanthe watsoni
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Clarkia viminea
Cleome lutea
Cleome serrulata
Cleome sparsifolia
Collinsia parviflora
Cordylanthus capitatus
Cordylanthus kingii
Cordylanthus laxiflorus
Cordylanthus maritimus
Cordylanthus ramosus
Corispermam hyssopifolium
Crepis runcinata var. *glauca*
Cryptantha circumscissa
Cryptantha hymenoides
Cryptantha leiocarpa
Cryptantha micrantha
Cryptantha pterocarya
Cuscuta californica
Cuscuta tenuiflora
Cymopterus montanus
Delphinium menziesii
Descurainia pinnata
Draba reptans
Eatonella nivea
Echinocereus engelmannii
Emmenanthe penduliflora
Ephedra antisyphilitica
Eriastrum filifolium
Eriastrum sparsiflorum
Ericameria ericoides
Erigeron caespitosus
Erigeron concinnus
Eriogonum acaule
Eriogonum angulosum
Eriogonum cernuum
Eriogonum deflexum
Eriogonum gracile
Eriogonum heermannii
Eriogonum inflatum
Eriogonum nutans
Eriogonum ovalifolium
Eriogonum plumatella
Eriogonum pusillum
Eriogonum sphaerocephalum
Eriogonum watsoni
Eriogonum wrightii
Erodium cicutarium
Eschscholzia californica
Euphorbia spathulata
Galium aparine
Gilia campanulata
Gilia congesta
Gilia inconspicua
Gilia leptalea
Gilia leptomeria
Gilia micromeria
Gilia subnuda
Glyptopleura marginata
Grayia spinosa
Grindelia squarrosa
Gutierrezia sarothrae
Gymnosteris nudicaulis
Helianthus annuus
Helianthus bolanderi
Helianthus giganteus
Helianthus nuttallii
Hermidium alipes
Hesperostipa comata
Hesperostipa comata
Heterotheca villosa
Hilaria jamesii
Hordeum jubatum
Hutchinsia procumbens
Hymenoclea monogyra
Idahoa scapigera
Ipomopsis polycladon
Ipomopsis pumila
Krascheninnikovia lanata
Lagophylla ramosissima
Lappula redowskii
Layia glandulosa
Layia heterotricha
Lepidium alyssoides
Lepidium dictyotum
Lepidium flavum
Lepidium fremontii
Lepidium nanum
Lepidium virginicum
Leptodactylon pungens
Leucocrinum montanum
Linanthus androsaceus
Linanthus bigelovii
Linanthus ciliatus
Lomatium dissectum
Lomatium macrocarpum
Lomatium nudicaule
Lotus heermanii
Lotus subpinnatus
Lupinus aridus
Lupinus brevicaulis
Lupinus pusillus
Lupinus sericeus
Lupinus uncialis
Lygodesmia juncea
Macrorrhynchus glauca
Madia elegans
Madia minima
Malacothrix californica
Malacothrix floccifera
Malacothrix sonchoides
Malvella leprosa
Matricaria discoidea
Mentzelia albicaulis
Mentzelia congesta
Mentzelia laevicaulis
Microseris cuspidata
Microseris lindleyi
Microsteris gracilis
Microsteris gracilis
Mimulus bigelovii
Mimulus glabratus
Mimulus rubellus
Mirabilis californica
Mirabilis linearis
Myosurus aristatus
Myosurus minimus
Nama aretioides
Nama demissum
Nicotiana attenuata
Nicotiana quadrivalvis var. *bigelovii*
Oenothera albicaulis
Oenothera alyssoides
Oenothera andina
Oenothera caespitosa
Oenothera deltoides
Oenothera triloba
Opuntia erinacea var. *hystricina*
Opuntia fragilis
Opuntia polyacantha var. *rufispina*
Opuntia polyacantha
Opuntia pulchella
Orobanche fasciculata
Orobanche ludoviciana ssp. *multiflora*
Orthocarpus luteus
Orthocarpus tolmiei
Oryctes nevadensis
Oxytheca dendroidea
Oxytheca perfoliata
Oxytheca watsoni
Paeonia brownii
Penstemon acuminatus
Penstemon angustifolius
Penstemon deustus
Penstemon glaber
Penstemon palmeri

Petradoria pumila
Phacelia bicolor
Phacelia crenulata
Phacelia curvipes
Phacelia glaberrima
Phacelia glandulifera
Phacelia gymnoclada
Phacelia gymnoclada
Phacelia incana
Phacelia integrifolia
Phacelia inundata
Phacelia ivesiana
Phacelia linearis
Phacelia tanacetifolia
Plagiobotrys fulvus
Plagiobotrys kingii
Plantago bigelovii
Plantago patagonica, var.
Plectritis congesta
Poa scabrella
Polanisia uniglandulosa
Polygonum aviculare
Polygonum tenue
Prunus andersonii
Psathyrotes annua
Psoralidium lanceolatum
Psorothamnus polydenius
Purshia tridentata
Ranunculus andersonii
Rhus aromatica, var.
Ribes leptanthum
Rigiopappus leptocladus
Sairocarpus kingii
Salvia columbariae
Salvia dorii
Sclerocactus pubispinus
Sclerocactus whipplei
Senecio fendleri
Senecio multilobatus
Sphaeralcea coccinea
Sphaeralcea emoryi
Sphaeralcea munroana
Sporobolus cryptandrus
Stanleya pinnatifida
Stanleya viridiflora
Stephanomeria exigua
Stephanomeria paniculata
Stephanomeria spinosa
Stephanomeria tenuifolia
Tetradymia canescens
Tetradymia glabrata
Thelypodium brachycarpum
Thelypodium integrifolium
Thelypodium laciniatum
Thysanocarpus curvipes
Tiquilia nuttallii
Townsendia strigosa
Tricardia watsonii
Tripterocalyx micranthus
Vulpia microstachys
Vulpia octoflora var. *glauca*
Xanthium strumarium
Zigadenus paniculatus

Appendix B—Plant Species Noted by C.H. Merriam, 1891

Ambrosia eriocentra
Amelanchier alnifolia
Arctostaphylos pungens
Artemisia arbuscula
Artemisia spinescens
Artemisia tridentata
Atriplex canescens
Atriplex confertifolia
Berberis fremontii
Ceanothus fendleri
Cercis canadensis
Cercocarpus ledifolius
Ephedra viridis
Fallugia paradoxa
Fraxinus anomala
Garrya flavescens
Glossapetalon spinescens
Grayia spinosa
Juniperus osteosperma
Krameria erecta
Krascheninnikovia lanata
Lycium andersonii
Menodora spinescens
Peraphyllum ramosissimum
Pinus aristata
Pinus flexilis
Pinus monophylla
Pinus ponderosa
Prunus fasciculata
Pseudocymopterus montanus
Psorothamnus fremontii
Psorothamnus polydenius
Purshia mexicana
Purshia tridentata
Quercus X pauciloba
Rhus trilobata
Ribes leptanthum brachyanthum
Salazaria mexicana
Salvia dorii var. *pilosa*
Sarcobatus vermiculatus
Sphaeralcea monroana
Stanleya pinnata
Symphoricarpos longiflorus
Tetradymia canescens
Tetradymia spinosa