HISTORICAL VEGETATION TYPES OF THE INTERIOR COLUMBIA RIVER BASIN

Prepared under Contract INT-94951-RJVA
For Systems For Environmental Management

This research was supported in part by funds provided by the
Intermountain Research Station
Forest Service, U.S. Department of Agriculture

B. John Losensky
ECOLOGICAL SERVICES

December 1994

DESCRIPTION OF THE HISTORICAL VEGETATION OF THE COLUMBIA RIVER BASIN

INTRODUCTION

In undertaking an assessment of the Columbia River Basin it was apparent that an understanding of the "natural" vegetation and the influences of natural processes was essential to determine what and how much the natural diversity has changed and how in tune the existing vegetation is with regard to climatic influences and ecological processes. The purpose of this paper is to provide a systematic assessment of vegetation in respect to the extent of each major cover type and, where appropriate, the age structure associated with the cover type. This data will provide a reference point that may be used to evaluate changes over time that are the result of management practices or control of natural processes.

An extensive literature search could be undertaken to describe what "natural" vegetation means or the impact of various native cultures on the American landscape prior to establishment of Euro-American settlement. I have taken a very simplistic approach and use the term to represent the vegetation present at the time that significant numbers of Euro-Americans settled the area. That this structure was at least somewhat stable can be documented with fire history investigations and bog analysis. (Mehringer et al 1977)

In conducting the investigation it was obvious that quantifiable information was not available before or at the time of settlement. Antidotal information is provided by early travelers and investigators but it was typically limited in area and not necessarily complete. In some cases major tree species may be identified but age structure and composition was ignored. Grasslands and shrublands were commonly addressed in an offhand manner with no attempt to identify species. With the establishment of the Forest Reserves starting in the 1890's a series of studies were undertaken that were designed to collect specific information pertaining to the resources available in the Reserves. The reports from these studies provide the first systematic review of the forest vegetation. They provided a description of tree species and their conditions including an assessment of age structure however cover type information was limited. Again little information was provided for the grassland types or their condition. More specific information on stand composition and age structure was collected after 1905 for limited areas and this approach continued until the 1930's when a nationwide inventory system was undertaken for all ownerships. These samples included mapping the various cover types and providing an assessment of age structure. This study also provided a uniform legend that was relatively consistent over a major portion of the study area. As in other studies little

attention was paid to the grassland types. These surveys did however provide the first systematic sample that could be evaluated statistically and permitted an evaluation of vegetation cover and structure of the forest environment.

At the start of the investigation it was necessary to determine the target date to be used in the evaluation since it could be argued that changes occurred with the Spanish explorations in the 1500's and subsequent introduction of the horse into Native American culture. Another major impact occurred in the early 1800's with the decimation of beaver in many of the streams in the Columbia River Basin (CRB). What impact these events may have had on the original vegetation cannot be evaluated as studies are not available from this time period and consequently were not considered. The scale of CRB assessment (1:1000000) also precludes being able to map most riparian areas as a separate entity. Development in the 1840's associated with mission activity impacted some scattered centers throughout the CRB but were of limited impact at the landscape level. Mining activity which began in the 1860's was the first period where extensive disturbance of the vegetation occurred and efforts were begun to curtail natural processes which might impact human development. This influence increased dramatically after 1880 with the introduction of railroads through the CRB particularly in areas such as Butte-Anaconda in Montana and Virginia City in Nevada. Extensive areas were harvested to support the railroad construction as well as mine development and fuel for power. Introduction of large herds of cattle began in the early 1880's also which had a dramatic impact on grasslands throughout the CRB. By the 1890's serious overgrazing had already occurred on most of the public domain and extensive portions of the more productive sites converted to agriculture use. As a result early data on species composition and structure are almost nonexistent. A second factor which compounds this problem are the effects of weather cycles which cause normal fluctuation in species coverage. When studies were begun on the grasslands in the 1930's it was in the midst of a major drought which influenced species composition and therefore provides a somewhat biased base for comparison.

In order to proceed a number of concessions were necessary. For grassland types limited pre-disturbance data could be found for most of the CRB, therefore information collected in the 1920's and 1930's was used. The extent of the various cover types could be approximated from this data. A generalized map of vegetation was developed by Shantz and Zon in 1923 for the United States which was further refined by Kuchler in the 1960's. These maps provided the basis for grassland vegetation where no other sources are available. These maps also provided a key for consistency among types from other sources that were used. Species composition from the early surveys was compared to recent studies for the various cover types where sites have recovered from past abuse and adjusted where necessary. In shrub and woodland communities age structure information would have been

very helpful to evaluate the permanence of the type however even today this type of information is very limited. As a result the debate on cover and structure of some sagebrush and pinyon-juniper types relative to fire impacts cannot be adequately addressed.

In forested types the 1930's data was used where available. While development had begun on some National Forest lands by then, it was either very localized or limited in extent. In most cases data was provided by cut and non-harvested land and adjustments for past harvest could be made. It was also felt that the 1930's data could be back dated one or two age classes with a reasonably high degree of accuracy. The backdating process is described in Appendix B.

Forest survey information was available for Washington, Oregon, portions of Nevada, northern Idaho, and western and portions of central Montana. Surveys for California were conducted during the 1940's. Forest Surveys were not conducted in this time period in western Wyoming, southwest Montana, southern Idaho and northern Utah. In these states surveys from the 1905 to 1930 period for individual drainages or Forests were used as samples to describe the stand structure in the appropriate Section.

The specific cover types described in this report were those used in the original survey and other than grouping similar types no attempt was made to restructure type definitions.

The map showing the cover types for the CRB came from a number of sources which are described in Appendix D.

MAJOR VEGETATION COVER TYPES

FOREST COVER TYPES

The following descriptions are based on the definitions presented in the 1930's Forest Survey or other source data used in this study. Specific age structure and species composition or other departure from the model type are described in each Section. The forested cover types were found on 40.36 percent of the CRB.

Ponderosa pine savanna (CT1) - This type was not defined in the original definitions of cover types for Montana and Idaho. In a footnote of the Fergus County, Montana report, the type is defined as a fringe type composed of ponderosa pine (Pinus ponderosa) forests forming very thin stands of quasi-commercial character, intermingled with prairie (USDA Forest Service 1943b). Based on Forest Survey stocking definitions these stands probably contained less than three thousand board feet per acre (USDA Forest Service 1935a). The definition is similar in northeastern Washington except stocking levels are lower averaging less than two thousand board feet per acre, are less than 10 percent stocked with pole trees and less than 40 percent stocked with

seedling-sapling trees. In eastern Washington and Oregon they were described as an area with solitary trees, or groups of trees too small to map separately, in which mature ponderosa pine is the predominating tree. It is a borderline zone, characteristic of the fringes of the desert and of the breaks between timbered plateaus and treeless canyons, where the area of grass or sagebrush may be as great or greater than the area of timber (USDA Forest Service 1936a). This type usually merges at its upper boundary with timberland types and at its lower limit with grass or shrub types. Savanna stands were not described in Utah, southern Idaho or Wyoming and apparently were included in the regular ponderosa pine type. No age data was presented for any of the studies however based on narrative descriptions they were generally dominated by mature or overmature trees. Juniper may be present on some sites but typically stands were pure ponderosa pine. The type represents about 0.2 percent of the CRB. It was mapped in four Sections in four states within the study area. Additional areas too small to map at this scale are present particularly in Oregon and southern Idaho.

Ponderosa pine (CT2) - In northern Idaho and western Montana it included stands containing at least three thousand board feet per acre of which 25 percent or more by volume was ponderosa pine. For Oregon and Washington the type contained approximately 50 percent or more, by volume, of ponderosa pine, sugar pine (Pinus lambertiana) , or Jeffrey pine (P. jeffreyi), or any combination of these species, except those in which sugar pine is the key tree. In California the type contained 80 percent ponderosa, Jeffery or sugar pine. In other states this amount of ponderosa pine would qualify it as a pure stand. These criteria could result in a wide difference in the amount of this type defined for the various areas. For example many of the stands that would have been defined as ponderosa pine in Montana are included in CT 53 in California. Western juniper (Juniperus occidentalis) is common on the drier sites. Two community types based on understory species are common for this type. A shrubby form characteristically has one or all of the following shrubs; snowberry (Symphoricarpos albus), ninebark (Physocarpus malvaceus), bitterbrush (Purshia tridentata), spirea (Spiraea betulifolia), and rose (Rosa spp.). The grassy form is dominated by one of the following grasses dependent on moisture availability; Idaho fescue (Festuca idahoensis), bluebunch wheatgrass (Agropyron spicatum) or needle-and-thread (Stipa comata). The type was normally restricted to broad valley bottoms or lower to mid slopes on high energy aspects. Stands commonly were very open with little shrub growth. Usually a moderate to dense cover of grass and other herbaceous plants were present. Trees often were single or grouped by age classes with a major portion mature. These groups usually result in an unevenaged stand structure. Forest litter is frequently limited to scattered cones and pine needles. The type represents a major transition between the shrub or grassland types and the more closed forests on mid slopes. On the warmer and drier portions of the type, ponderosa pine formed almost pure stands. Douglas-

fir (Pseudotusga menziesii),, white fir (Abies concolor) or grand fir (A. grandis) were common associates on moister sites. Fire played an important role in maintaining this type on major portions of its natural range and kept stands in a very open condition. Fire return intervals varied between 5 to 25 years and were typically underburns. The type represented 11.8 percent of the CRB and is found in five states and 19 Sections.

Douglas-fir (CT3) - Stands in northern Idaho and western Montana contained at least four thousand board feet per acre of which 60 percent or more by volume was Douglas-fir (Kemp 1949; USDA, Forest Service 1936a, 1937d). In California, the type contained 80 percent Douglas-fir or mixtures of Douglas-fir and the true firs in which Douglas-fir comprises 20 percent or more of the commercial conifer cover (Wieslander et al 1946). Areas that would meet the Douglas-fir type in Montana may be included in CT53 in California. It was commonly found on various aspects from low to upper slopes that were moister and cooler than the ponderosa pine type. Sites were normally dominated by Douglas-fir or with mixtures of other mesic species. On high ridge lines or high energy slopes, stands were typically mature and open grown with a limited understory. Cooler north slopes were generally dense younger aged stands. In the western portion of the CRB stands took on the characteristics of the coast form Douglas-fir. Age structure was typically older with the oldest trees at least twice the age commonly found in interior Douglas-fir types. Age structure for the type could be highly variable with both evenaged and unevenaged stands common. Associates in the interiorportion of the CRB were ponderosa pine on the warmer sites, lodgepole pine (Pinus contorta), larch (Larix occidentalis), grand fir, western red cedar (Thuja plicata) on the moist sites and Engelmann spruce (Picea engelmannii), subalpine fir (Abies lasiocarpa) and lodgepole pine on upper elevation sites. On the western portion white fir, western hemlock (Tsuga heterophyla) and true firs were common associates. Understories were either grass dominated or shrub as in the ponderosa pine type. Shrub communities contained snowberry, spirea, or ninebark on warm sites and huckleberry (Vaccinium) on cool sites. Warm site grass communities consisted of wheatgrass or Idaho fescue on warm sites and pinegrass (Calamagrostis rubescens) and elk sedge (Carex geyeri) on cool sites. The role of fire varied by landform and aspect. On low elevation high energy sites like those found on the contact with the grassland types in central Montana, fire frequencies averaged between 15 and 30 years and were normally light underburns. High ridgeline sites had a similar structure but the fire frequency may have been slightly longer. On north or more mesic slopes the fire frequency was typically 40 to 60 years and were more intense. Partial burns or stand replacement events were more common. The type represented 6.5 percent of the CRB. It was found in 19 Sections in six states.

Douglas-fir savanna (CT4) - This type was primarily found in eastern Montana on sites which are normally considered sites for

ponderosa pine but are too cold for its survival. It was not defined in the original survey descriptions, but in a footnote in the Fergus County, Montana report the type is defined as a fringe type composed of Douglas-fir forests forming very thin stands of quasi-commercial character, intermingled with prairie. Based on stocking definitions these stands probably contained less than three thousand board feet per acre (USDA, Forest Service 1943b). Stands were typically very open with very large rough thick barked trees common. Ground cover was very light composed principally of grasses such as wheatgrass or Idaho fescue. Stands were normally multi-aged. The type was found in trace amounts in two Sections in Montana. Small areas are probably present in southern Idaho also but not mapped.

Larch-Douglas-fir (CT5) - In Montana and Idaho it is defined as stands containing at least four thousand board feet per acre of which 75 percent or more by volume is larch-fir (Kemp et al 1949; USDA, Forest Service 1937d). In Oregon and Washington a type of this name is not defined however the upper-slope mixture cover type represents the same environment and is included. It is defined as mixed forests ordinarily above the ponderosa pine zone, which contain only negligible quantity of that species. They are characteristic of the colder, moister sites and contain variable proportions of larch, white fir, subalpine fir, Douglas-fir, Engelmann spruce, lodgepole pine, white pine (Pinus monticola) and occasionally other species (USDA, Forest Service 1936a). The optimum development of this type occurred in northwestern Montana particularly around the Kalispell area and Swan and Clearwater Valleys. The type is typically on slightly drier sites-than the white pine type and usually fewer species are present. Occasionally grand fir in Idaho and Engelmann spruce in Montana are major components. While lodgepole pine was commonly associated with the larch type, particularly in Montana, it was typically young in age. Understory species are similar to the Douglas-fir type with the addition of mesic forbs and shrubs. Dry site grasses are largely absent. Stand structure varied by topographical position. Open grown stands of almost pure mature larch were common in the larger valley bottoms while stand structure was highly variable in age and composition on other sites. On the open valley sites the fire cycle was similar in frequency to the ponderosa pine type but because of the better site productivity fuel buildups were greater and fires were more intense. Mesic upland sites had a frequency and intensity similar to the Douglas-fir types. There is evidence that at the' upper portions of the type the cover may have shifted between larch and lodgepole pine as a result of a severe fire following a low seed period for larch. How significant this shift was is unknown but it does represent one of the few cases that show a regular shift in cover type as a part of the normal vegetation cycle. While the type represented only about three percent of the CRB it may be under represented by the typing in the Blue Mountains. The type was defined for nine Sections in four states.

White pine (CT6) - For Montana and Idaho it is described as stands containing at least four thousand board feet per acre of which 15 percent or more by volume is white pine (Kemp et al 1949; USDA, Forest Service 1937d). In Oregon and Washington portions of the pine mixture and upper-slope mixture types may meet the above definition but were not identified separately (USDA, Forest Service 1936a). These stands would have been found primarily in the Blue Mountain area of Oregon. In California areas that contained more than 20 percent white pine were typed as white pine however at the level of mapping no areas were recognized and are included in the mixed conifer type (CT53). The heart of the white pine cover type was in north Idaho with some occurring in northwest Montana and northeastern Washington. The definition for this type permits a wide variety of species composition. White pine generally made up more than a third of the stand volume with extremes in the 80 percent level however other tree species were more variable and any one species probably did not exceed 20 percent of the volume. Common associates were Douglas-fir, larch and grand fir with variable amounts of spruce, red cedar and hemlock. The type was commonly found on all but high energy slopes or upper subalpine environments. Stands tended to be dense with multi-layers common. Age structure was generally variable with a limited percent of overmature stands. Fire frequencies ranged from 50 to 150 years and were commonly stand replacement events. The type was a minor type in the CRB covering 1.7 percent of the area in six Sections in three states.

Pine-DF-fir (CT53) - A type found in California and Nevada which is a mixture of the commercial pines and/or Douglas-fir, incense cedar (Libocedrus decurrens) and the true firs in which no one species comprises as much as 80 percent of the commercial conifer cover. (USDA, Forest Service 1946). This type extends into Oregon along the Siskiyou Mountains but was not mapped in the CRB. The species occur in many combinations and mixtures with Douglas-fir the most abundant species. Sugar pine and ponderosa pine usually occur as scattered individuals and incense cedar is more abundant on the xeric sites. The true firs are commonly in the understory component. The major portion of this type has a sparse understory with coverages typically less than 20 percent. On moist portions of the type mesic shrubs such as vine maple (Acer circinatum) and yew (Taxus brevifolia) are common. Stand replacement fire can result in shrub field development. Ceanothus (Ceanothus velutinus) is an important brushfield dominant and it may persist particularly on dry sites. The fire cycles is probably similar to the Douglas-fir type. The type represents 0.7 percent of the CRB and found in three Sections in two states.

Lodgepole pine (CT7) - In Montana and Idaho stands contained at least three thousand board feet per acre of which 50 percent or more by volume is lodgepole pine (Kemp et al 1949; USDA, Forest Service 1936a, 1937d). In California lodgepole pine comprised 80 percent or more of the commercial conifer cover (Wieslander et al

1946). The type was common through out the CRB particularly in southern and central Idaho, southwestern and eastern Montana and western Wyoming. Climatic conditions for the lodgepole pine type is characterized by low summer rainfall, wide diurnal temperature fluctuations especially in the summer and a relatively short growing season. Stands were normally confined to the mid to upper slopes on all aspects but normally on the drier environments. Pure or nearly pure stands are common however a wide variety of species could be cohorts and varied depending on climatic conditions. Grand fir, Engelmann spruce, and Douglas-fir were the most common associates along with white pine and larch. In Oregon ponderosa pine and lodgepole pine grow together in a distinct pattern with lodgepole pine found in frost pockets and poorly drained soils while ponderosa is confined to the better drained soils on slight rises. Common undergrowth species are huckleberry, beargrass (Xerophyllum tenex) and pinegrass in Montana and Idaho while a variety of species found on dry or very wet sites are common in Oregon. Of interest is the lack of significant amounts of subalpine fir during the 1900 time period. Stands were commonly dense with a great deal of deadfall and normally immature or younger in age. In Oregon on pumice soils and in the Yellowstone Park area climax stands of lodgepole pine are found. Underburning on a 50 year cycle is common on the more gentle terrain while stand replacement fires occurring every 75 to 150 years is typical of all sites. The type occupies 8.4 percent of the CRB occurring in 19 Sections in five states.

Spruce-fir (CT8) - In Montana and Idaho stands contained 50 percent or more Engelmann spruce by volume with less than 15 percent white pine (Kemp et al 1949; USDA, Forest Service 1936a, 1937d). This type is not recognized in Oregon and Washington, however portions of the upper-slope mixture type may meet the definition but are not identified. In California a fir type is recognized and defined as areas in which true firs, Engelmann spruce, Colorado blue spruce (Picea pungens), or mountain hemlock (Tsuga mertensiana) , singly or in combination comprise 50 percent or more of the commercial conifer cover (Wieslander et al 1946). In northern Idaho and Montana the type was associated with the white pine type while in eastern Montana, Wyoming, southern Idaho it was common in riparian zones and high basins. Subalpine fir was a common component along with grand fir, lodgepole pine and minor amounts of Douglas-fir. In the Yellowstone Park area significant amounts of lodgepole pine are included in the type. The type is usually subject to heavy snowfall. Temperatures are low both in summer and winter. Open parks and meadows are common throughout the type. Because of the high precipitation the sites are not highly flammable. This factor along with the short growing period results in a long fire free period averaging about 200 years. When they do burn they are usually stand replacement events. The type is found in 18 Sections in five states and represents 2.5 percent of the CRB.

Lodgepole pine-spruce-subalpine fir (CT61) - A type defined for the Yellowstone Park (USDI, National Park Service 1945).

Percentage of species were not indicated but these sites probably represented old lodgepole stands where more tolerant species were becoming established or areas that would fit the spruce-fir Forest Survey type with a mixture of lodgepole pine present. The type was found in two Sections and represented about 0.2 percent of the CRB.

Douglas-fir-lodgepole pine-spruce (CT64) - A composite of types for Yellowstone Park including areas typed as Douglas-fir; Lodgepole pine; spruce-subalpine fir; lodgepole pine-spruce-subalpine fir and lodgepole pine-Douglas-fir-subalpine fir. Percentages of various species was not indicated (USDI, National Park Service 1945). Other than the last type listed they would represent types described above but too small to map at this scale. The LP-DF-SAF probably represents areas that would type as lodgepole pine or Douglas-fir under the Forest Survey types and would represent the contact between the Douglas-fir and lodgepole pine types at mid to upper slopes positions. The type represents a trace of the CRB and is confined to one Section.

Subalpine (CT9) - In Montana and Idaho this type includes all forest growth above the altitude limit of merchantability plus areas typed as rocky-noncommercial. These are defined as too rocky, too steep, or too sterile to produce a stand of commercial size, density, and quality. The timber may consist of any species, but is not and is not likely to be of commercial value because of low quality, poor form and low volume (Kemp et al 1949; USDA, Forest Service 1937d). In Oregon and Washington the type is defined as forests at the upper limits of tree growth, usually unmerchantable because of poor form and small size. Principal components are subalpine fir, mountain hemlock, Shasta red fir (Abies magnifica var. shastensis), lodgepole pine, whitebark pine (Pinus albicaulis), western white pine, and alpine larch (Larix lyalli). It is usually interspersed with meadows and glades (USDA, Forest Service 1936a). For California it represents forest land incapable of yielding usable wood products (usually saw timber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future (Wieslander et al 1946). Includes a minor amount of productive land withdrawn through statue, ordinance, or administrative order. The Forest Survey defines this type as two associations: lodgepole-white pine which are stands of lodgepole pine, western white pine, or mountain hemlock alone or in association with the true firs; and whitebark-foxtail pine which are stands of whitebark pine, limber pine (P. flexilis), or bristlecone pine (P. aristata) alone or in association with any other trees (Wilson 1941). This type is very similar to the subalpine type found in Montana, Idaho, Oregon and Washington with the introduction of species common to Nevada and California. In Nevada the type is described as a fairly dense to quite open forest; medium tall in lower elevations to krummhloz in high altitudes with numerous shrubs and herbaceous plants. Dominants are whitebark pine, foxtail pine (Pinus balfouriana) lodgepole pine and mountain hemlock (Kuchler 1964). The fire cycle is

highly variable based on composition and its juxtaposition with downslope types. Long fire free periods are probably common exceeding 200 years. The effects however are long lasting because of the slow growth in these environments. Age structure was not defined for this type by the Forest Survey. About 4.5 percent of the CRB is in this type and it is found in 17 Sections in six states. ,

Hardwood riparian (CT12) - For areas in Montana and Idaho it represents stands where cottonwood (Populus trichocarpa) predominates (Kemp et al 1949; USDA, Forest Service 1937d). In Oregon and Washington it represents forests in which maple (Acer), aspen (Populus tremuloides), cottonwood, etc. predominate; pure or in mixture (USDA, Forest Service 1936a). These stands were typically found along the major rivers and streams as narrow bands in the riparian areas. This type is particularly important in eastern Montana along the major rivers. Little information is available on structure of these sites. Antidotal descriptions suggest that major areas were in young and/or very open stands. While common throughout the CRB only limited areas were mapped because of its limited areas. It represented only a trace amount of the CRB and mapped in four Sections.

Aspen-grass (CT74) - A type defined for Yellowstone Park and southern Idaho. Species percentages were not indicated. The type was probably characterized by aspen groves with an undergrowth of grasses and associated with meadow environments (USDI, National Park Service 1945). This type becomes much more important south and east of the CRB. Stands may have an understory of young conifers but typically they were replaced by fire on a 60 year cycle. Studies suggest that the aspen clones can be quite old resprouting from the same root system after each fire cycle. The type represents 0.2 percent of the CRB and found in five Sections. Additional areas are scattered across the CRB particularly in central Oregon, eastern Idaho and Utah however they were either too small to map or were included in another type.

White fir (CT90) - A type found in Oregon and Washington in which the forests contained 50 percent or more, by volume, of grand fir or white fir. Usually they occur within the range of ponderosa pine on moister environments (USDA, Forest Service 1936a). Moisture and temperature are both favorable for tree growth and generally are not limiting. Tree composition can vary between seral species and the true firs over time as a result of periodic fires. Typically ponderosa pine, Douglas-fir and lodgepole pine were major components of the stand. Understories were rich floristically with a wide range of forbs, shrubs and grasses present during various periods of its development. Shrubfields could develop after a severe fire event with ceanothus a major cover species. Fire cycles probably occurred on a 50 to 75 year cycle with intensity ranging from underburning to stand replacement events. The type represented 0.2 percent of the CRB

and was found in four Sections.

Fir-hemlock (CT91) - In Oregon and Washington the type consists of stands in which either noble fir (Abies procera), silver fir (A. amabilis), subalpine fir, Shasta red fir, white fir, mountain hemlock (or occasionally, western hemlock), or any combination of these species composes at least 50 percent of the volume of the stand, This type is characteristic of the upper slopes of the Cascade Range (USDA, Forest Service 1936a). In Montana and Idaho the type is called western hemlock-white fir and defined as stands containing 50 percent or more, by volume, of western hemlock and white fir, separately or combined, or which contains sufficient hemlock and white fir trees to make 50 percent or more by volume at maturity (USDA, Forest Service 1937b). These types are typically very rich vegetatively and represent some of the best sites with good moisture availability and mild winter conditions. Fires are typically stand replacement events on a 150 year cycle. A shrubfield can develop following fire but is usually of short duration before tree cover overtops it. The type represents 0.5 percent of the CRB and is found in four Sections.

Sitka spruce (CT93) - A type in which 50 percent or more by volume is Sitka spruce (Picea sitkensis) (USDA, Forest Service 1936a). It is rarely in pure stands and usually in mixture with Douglas-fir, western hemlock or western red cedar. This type is a part of the coast communities and represents a minor intrusion into the CRB. This is a very rich site and is more representative of the older aged stands on the coast. Communities may develop for extended periods between fire events and windfall gaps may be important in maintaining spruce as a component of the stand. Hardwoods such as red alder (Alnus rubra) may form a significant part of the vegetation cover following a major site disturbance. The type is found only in trace amounts in two Sections.

Western hemlock (CT94) - A forest type in Washington in which 50 percent or more of the volume is western hemlock with a variable amount of Douglas fir, western red cedar, silver fir, and Sitka spruce (USDA, Forest Service 1934a). This type also represents the coastal environment and found only in trace amounts in the CRB in one Section. It is also characterized by extended periods between major vegetative disturbance.

The following types are found in the CRB but were in blocks too small to map at the landscape scale. Other types could also be found in this group but were not mapped by early investigators.

Western red cedar (CT92) - Forests in Oregon and Washington containing approximately 40 percent or more, by volume, of western red cedar. It is largely confined to swamps and stream margins (USDA, Forest Service 1936a). In Montana and Idaho they represent stands in which western red cedar predominates by

volume, with less than 15 percent by volume of white pine or 50 percent by volume of hemlock in the mixture. Common associates are western hemlock, lowland white fir, western white pine and occasionally, Douglas fir and larch (USDA, Forest Service 1935a). Environments are such that fire has limited impact and while they may burn into the type from adjacent drier sites they usually kill only individuals or small groups of trees.

Western red cedar-white fir (CT96) - This is a type defined for Montana and Idaho and is composed of cedar and lowland white fir, the former nearly pure in patches, the latter predominant for the stand as a whole, with a considerable amount of Douglas fir, some ponderosa pine in groups on the knolls and as scattered individuals and rarely single white pines (USDA, Forest Service 1935a). This type is similar to CT92.

WOODLAND COVER TYPES

In the transition zone between forest and shrub or grassland cover types is commonly found a woodland type or types dominated by shrubby species of juniper, limber pine, pinon pine, oak and other species of hardwoods. In portions of the CRB such as Nevada this type represented the only tree cover. The group represented about 3.4 percent of the CRB. Following are a group of types found in this environment.

Pinon-Juniper (CT27) - This is a major woodland type in the CRB and is defined as open groves of low, often shrub-like evergreen trees with varying admixtures of shrubs and herbaceous plants (Kuchler 1964). Dominant trees are western juniper, oneseed juniper (Juniperus monosperma), Utah juniper (Juniperus osteosperma), Pinyon pine (Pinus edulis) and oneleaf pine (Pinus monophylla). Common shrubs are sagebrush (Artemisia), rabbitbrush (Chrysothamnus), bitterbrush, serviceberry (Amelanchier), mountain mahogany (Cercocarpus ledifolius) and snowberry. Common grasses are bluebunch wheatgrass, bluegrass (Poa sandbergii), squirrel-tail (Sitanion hystrix), needlegrass and Idaho fescue. Only minor areas in Nevada and Utah contain significant amounts of pinyon pine and for most of the CRB juniper is the only tree species. This type alternates with CT13 with the pinon-juniper type found on the rough broken country or shallow stony soils while sagebrush-grass is found on the more level ground with deep soils. The type is characterized by hot, dry summers with precipitation less than 20 inches. Tree cover varies from open, scattered to dense stands with the understory varying accordingly. It represents about 3.2 percent of the CRB and is particularly important in Nevada. The type is found in five states and 13 Sections of the CRB.

Oak-madrone (CT44) - This area is defined for California and Oregon and represents areas with hardwood trees (oaks (Quercus), madrone (Arbutus menziesii), etc.) and herbaceous vegetation occurring in mixture and the trees covering from 5 to 80 percent of the ground area (Wieslander et al 1946). Other conifers may

provide minor cover. These sites are generally too dry for sagebrush. Important tree species are California black oak (Quercus kelloggii), Oregon white oak (Q. garryana) and Pacific madrone. Big-leaf maple (Acer macrophyllum) may also be'present. Common shrubs are serviceberry, snowberry, rose, smooth sumac (Rhus trilobata) and California hazel (Corylus cornuta). The type ranges from very open savannas with grass understories to dense forest stands. Many of these sites were either maintained by frequent fire and kept in a very open condition. The type represents about 0.1 percent of the CRB and found in two Sections. This type is more common on areas west of the Cascade Range.

Bristlecone pine-Limber pine (CT83) - A minor type found in three Sections in Nevada that is similar to the juniper type. It was usually found on mountain crests of the highest ranges in the Great Basin. It consists of,open forest of low to medium tall trees with shrubs and grass especially at the lower portion of its elevation range (Kuchler 1964). Dominants are bristlecone pine and limber pine. It is found above CT27 on cool dry sites. Some of the oldest known trees are found in this type and fire while present, had limited impact on much of the type. The type represents less than 0.1 percent of the CRB and is confined to one Section.

SHRUBLAND COVER TYPES

This group represented the largest percentage of the CRB accounting for 41.9 percent of the area. It also represents an area where the frequency of fire could have a dramatic impact on the definition of the cover type. Was the sagebrush-grass type for example a grassland with scattered shrubs or were these sites always dominated by sagebrush. Probably neither case was correct with areas adjacent to major mountainous areas containing less sagebrush than the vast areas in the Snake River Plains because of greater fire frequency. Unfortunately much of the literature and study has focused on effects on existing communities with fire considered a disturbance of the sagebrush or on the other hand the use of fire to eliminate sagebrush and enhance grazing for domestic livestock (Britton 1984, Bunting 1984, Tisdale 1979). These types need to be evaluated within the context of effects of grazing of native ungulates and natural fire frequencies to better understand their structure.

Sagebrush-grass (CT13) - This type is probably one of the most extensive in the CRB covering 34 percent of the land area. As you may expect composition and structure probably varied greatly over time and space. Since some of varieties of sagebrush have only recently been identified early mapping efforts did not map them separately. The modal type is big sagebrush (Artemisia tridentata-tridentata) which is typically a pure open stand of sagebrush. Sites are well drained free of alkali and receive 10 to 15 inches of precipitation a year. Understories of the sagebrush communities are dominated by bluebunch wheatgrass and

various amounts of Idaho fescue, Sandberg's bluegrass, needle-and-thread, Thurber's needlegrass (Stipa thurberiana), and squirrel-tail. On -warmer, drier or shallow soil sites Wyoming big sagebrush (A. t.-wyomingensis) is found. Soils may also be slightly alkaline. A wide variety of grasses are found with this species depending. on moisture availability including bluebunch wheatgrass, Sandberg's bluegrass, squirrel-tail, Thruber's needlegrass and needle-and-thread, Mountain big sage (A.t.-vaseyana), is found on sites with more moisture and lower temperatures. All varieties are highly susceptible to mortality from fire and do not resprout. Regeneration is largely from stored seed in the soil. Other species of sage which may be found are low sage (A. arbuscula) which is a major species in the northern intermountain area. It is found at medium to 'high elevations on shallow soils or soils with high coarse fragments. Soils are very dry by mid-summer. Fire is not common because of the scarcity of fuel. Sandberg's bluegrass, bluebunch wheatgrass and Idaho fescue are found in varying amounts depending on moisture availability. Black sage (A. nova) is common on shallow and gravely, well drained and often calcareous soils. Sites are generally drier than areas of low sage. It may be found with salt-desert vegetation and is virtually fire proof because of sparse vegetation. Bluebunch wheatgrass and Sandberg's bluegrass are the major grass species. Silver sage (A. cana) is found mostly east of the continental Divide usually on deep light textured soils. A sub species, bolandei, grows on poorly drained soils in central Oregon and eastern California. The species sprouts readily after fire. Stiff sage (A. rigida) is found on extremely shallow to bedrock soils usually of basalt material. The type is found mainly in the Palouse Prairie area in Oregon, Washington and Idaho. A minor area is also located in southwestern Idaho. Stands are open and sparse and almost immune to fire. Sandberg's bluegrass is the principal grass. Soils can be supersaturated in the spring and extremely dry during the summer. Early low Sage (A. longiloba) is a minor species found on shallow, poorly drained sites with dense clay layers in the subsoil. It occurs in small defined stands. Rothrock sage (A. rothrockii) is also a minor type found at high elevations in California and Wyoming on deep soils. Large areas of the sagebrush may be killed during extended extreme drought. Plants are seldom over 50 years of age as a result of drought and fire: In parts of the CRB, particularly California, the type is described slightly broader and includes bitterbrush, and saltbushes (Atriplex) along with sagebrush. Little rabbit brush '(Chrysothamnus stenophyllus) or big rabbit brush (C. nauseosus) may dominate the site. These two species were common on sandy soils or drier sites and apparently developed after drought or fire killed the sagebrush. During periods of favorable moisture sagebrush will replace this type. This type was found in all Of the states in the CRB and on 22 Sections (Colville 1896, Day 1985, Franklin 1973, Hironaka et al 1983) .

Sagebrush-fescue (CT36) - The major difference between this type and type 13 is the presence of Idaho fescue as a major grass

species. The type was described in Washington and sites are typically moister and grasses provide a higher coverage than the typical sagebrush community. Perennial grasses make up a higher proportion of the plant coverage and growth conditions are better than type 13. Fire response is similar to type 13. The type is found in Washington in one Section and represents about 0.3 percent of the CRB (Franklin 1973).

Fescue-snowberry (CT37) - This type represents the moistest of the steppe zones and is referred to as meadow steppe. The type was described in Washington and Idaho with the herbaceous component dominated by Idaho fescue, bluebunch wheatgrass, Junegrass (Koeleria cristata) and Poa (Poa ampla) along with a great variety of forbs. The shrub layer is composed of dwarfed, inconspicuous sterile shrubs scattered through the herbland including snowberry and rose (Rosa nutkana or woodsii). The patches of shrubs are stable within the grass community and fire apparently has little effect on the balance between the grass and shrub components of the community. The type represents about 1.1 percent of the CRB and found in six Sections. Small unmapped patches of this type may be found elsewhere in the northern portion of the CRB (Franklin 1973).

Fescue-rose (CT38) - This type is very similar to 37 however snowberry is absent. It is found in the rain shadow of the Blue Mountains in Oregon and Washington in trace amounts. The type is confined to two Sections (Franklin 1973).

Threetipped sage-fescue (CT39) - The type was defined for Washington and is considered part of the meadow-steppe associations. A dense sward of grasses including Idaho fescue, bluebunch wheatgrass, bluegrass and three-leaved sedge (Carex filifolia) are common along with a variety of forbs and a discontinuous layer of sage. This type is a part of the general sagebrush community except fire has less influence because of the sprouting ability of this sage. Moisture conditions are typically better than most sagebrush sites. Shrubs found on types CT37 and CT38 are missing. The type represents 1.6 percent of the CRB and found in three Sections (Franklin 1973).

Bitterbrush-fescue (CT41) - The type described in Washington appears like a shrub steppe however it has an abundance of broad-leaved forbs. It is found on sandy or loose volcanic or poorly disintegrated rocky soils generally in the northern portion of the CRB. It is found at higher elevations than sagebrush near the ponderosa pine type however the site conditions are similar except for the soil. Bitterbrush is the only tall shrub along with a dense layer of bluebunch wheatgrass, Idaho fescue, bluegrass and balsam root (Balsamorhiza sagittata). Bitterbrush is sensitive to fire and because of its proximity to the ponderosa pine type which has a high fire occurrence the type may have been maintained as a scattered shrub community in a heavy stand of bunchgrasses. The type is found in trace amounts on two

Sections however areas may be found throughout the northern part of the CRB which are too small to map at this scale (Franklin 1973) .

Chaparral (CT43) - Found primarily in California this type supports heavily branched dwarf trees or shrubs, usually evergreen, the crown canopy of which covers more than 50 percent of the ground (Wieslander 1946). It is typically found between the ponderosa pine and the desert shrub types. While subjected to extended periods of drought it does not experience the extreme heat or dry air of the desert shrub type. The most common chaparral constituents are species of manzanitas (Arctostaphylos), scrub oaks, mountain mahogany, bear-brush (Garrya), ceanothus, and chamise (Adenostoma). In Nevada Ceanothus and greenleaf manzanita (Arctostaphylos patula) are key species in the main formation with curl-leaf mountain-mahogany dominant along the arid borders. It is found in trace amounts in the CRB in one Section.

Desert shrub (CT47) - This is a large more general type which covers 4.4 percent of the CRB (Kuchler 1964). It consists of a mixture of shadscale (Atriplex confertifolia), salt sage (Atriplex nuttallii), or saltbush-greasewood (Atriplex-Sarcobatus) communities found on saline sites. Other shrubs are spiny hopsage (Atriplex spinosa), winterfat (Eurotia lanata) and bud sage (Artemisia spinescens). Grasses are wild-rye (Elymus cinereus), beardless wild-rye (E. triticoides) and desert saltgrass (Distichlis stricta). On some sites Indian ricegrass (Oryzopis hymenoides) and galleta (Hilaria jamesii) are important species. The type commonly occupies areas of extreme diurnal temperature fluctuations, considerable wind and high evaporation rates. It is found in half of the eight states in the CRB but makes better development to the south and east. It represents about 4.4 percent of the CRB and is found in seven Sections. Areas that would meet the definition for CT50 and CT56 are included within this type either because of the small area they cover or because of the broader mapping done in some areas by early investigators.

Shadscale (CT50) - The shadscale type is found on sites where the soil moisture is less than the minimum required for sagebrush growth. It occupies arid valleys and bench lands where the annual rainfall is less than 8 inches (Shantx & Zon 1923). It grows mainly on shallow, heavy soils with more or less alkali in the subsoil. Associates are saltbushes on shallow alkaline soils, winter fat, little rabbit brush and bud sage. Generally there is little herbaceous growth and the shadscale plants are scattered evenly over the area but never produce a dense stand. During periods of extreme drought large areas of the type may be killed. Fire probably played a minor role in this type. The type is confined to one Section in Utah and represents 0.1 percent of the CRB.

Mountain Brush (CT54) - The type was described in Utah with the

most important plants being snowberry, sagebrush, oak, serviceberry, mountain mahogany and chokecherry (Prunus). Ceanothus, mountain maple, squaw apple (Peraphyllum ramosissimum) and bitterbrush may also be present on portions of the type (Deeds 1932). Scattered patches of scrubby aspen are also present. The type usually has an undergrowth of grasses and weeds. It represents a transition between the high mountain vegetation and the foothills. The type is more important south of the CRB and represents only trace amounts of area. The type was found also in Idaho and in three Sections.

Greasewood (CT56) - A type common in Utah found on sites where poor drainage has resulted in an accumulation of alkali and a vegetative growth limited to alkali-resisting plants (Deeds 1932). Associated with greasewood are saltbush and some of the alkali-tolerant grasses - dropseed (Sporobolus), cordgrass (Spartina) and saltgrass. On less alkaline sites greasewood is found in mixture with shallow-rooted grasses and forbs. Tall rabbit brush, shadscale, muhly (muhlenbergia), dropseed grass, grama grass (Bouteloua) and triple awn (Aristida) are common. On sites with a high water table salt grass and alkali sacaton (Sporobolus airoides) are common. In black alkali areas the land is substantially barren. The type includes the Great Salt Lake desert in which the alkali concentration is so high that no vegetation of any kind grows. This area may have been better assigned to CT85. The type is also found in Wyoming but represents less than 0.1 percent of the land area in the CRB. It is confined to three Sections.

Willow (CT69) - This is a minor type defined for the Yellowstone Park and probably represented wet meadows with willow shrubs. Common species were Geyer willow (Salix geyeriana), drummond willow (S. drummondiana), booth willow (S. boothii) and wolf willow (S. wolfii) . Major understory grasses were bluejoint reedgrass (Calamagrostis canadensis), fowl bluegrass (Poa palustris), water sedge (Carex aquatillis) and beaked sedge (C. rostrata). Beaver probably played a major role on the size and extent of this type. During drought periods fire may burn through these sites but recovery is very rapid from resprouting. The type covered only trace amounts of the CRB and was confined to two Sections in Wyoming. While probably occurring throughout the CRB it was either included with the adjacent types by observers or was too small in extent to be mapped at this scale.

GRASSLAND COVER TYPES

The grassland cover types represent one of the most impacted cover types in the CRB. Heavy use of the grass resource began in the 1880's and by the 1890's observers were commenting about the extreme overuse of the system. Unfortunately little study had occurred on these systems prior to this time and little quantifiable information exists on their natural state. In addition species composition and'coverage varies greatly

depending on normal climatic fluctuations and descriptions that were collected must be evaluated in light of the short term climatic conditions that existed at that time. Systematic studies were not conducted until the 1920's and 30's which was at the end of a period of extreme overuse and drought conditions. While grasslands have demonstrated a resiliency to recover, the lack of natural fire and the introduction of exotics may have had major impacts on present vegetation structure and there is no assurance that the communities being described existed prior to Euro-American arrival. Additionally defining cover types in the plains area along the eastern edge of the CRB is complicated by an expanse of grassland in which four species of grass (blue grama, western wheatgrass, needle-and-thread and Sandberg's bluegrass) and one sedge (threadleaf sedge) predominate throughout. A similar problem exists in eastern Oregon and Washington and western Idaho where three species (bluebunch wheatgrass, Idaho fescue and Sandberg's bluegrass) are found in various mixture. As a result there is generally little agreement among many of the maps that show grassland types in the CRB. In general I used the information shown on the oldest maps for the following types. The type represented 13.24 percent of the CRB.

Wheatgrass-fescue (CT14) - This type is the most important grassland type in the CRB covering about 7.8 percent of the area. It is described as open to fairly dense grassland of usually rather short grasses dominated by bluebunch wheatgrass, Idaho fescue, Rough fescue (Festuca scabrella) and needle-and-thread (Kuchler 1964). In the intermountain valleys the type is distinguished by meadow grasses - hairgrass (Deschampsia spp.), oniongrass (Melica spp.), and bentgrass (Agrostis spp.) and sedges. Other common grasses are sandberg bluegrass, Canada bluegrass (Poa compressa) and junegrass. Idaho fescue may be absent on the drier portions of the type. Shrubs are limited but big sagebrush and willows may be present. On the east side of the Continental Divide shrubs play a more important role. This cover type represents the vast majority of grasslands in western and central Montana, eastern Washington and northern Idaho. Idaho fescue is the most sensitive to fire particularly to summer and fall fires and can take up to 30 years for recovery to prefire conditions. Bluebunch wheatgrass is less sensitive and commonly survives a fire even during the growing period. Rough fescue probably is the most tolerant to fire and may return to preburn coverage in 2 to 3 years. Studies by Losensky (unpublished data) suggests a fire return of at least every 17 years for an area near Bozeman, Montana. Near the foothills of the Cascades Range it is considered a meadow-steppe type. It lacks any distinguishing shrub and Idaho fescue and bluebunch wheatgrass dominate the site along with an abundance of perennial herbs such as hounds-tongue hawkweed (Hieracium cynoglossoides) . Portions of the type were a bluegrass-oatgrass (Danthonia unispicata) mixture. In the Yellowstone Park area portions may be defined as wet meadow and dominated by sedges. The type is found on about 7.8 percent of the CRB in 19 Sections.

Wheatgrass-needle & thread-grama (CT15) - This type is characterized by a rather short, open to fairly dense stand of grass dominated by western wheatgrass, (Agropyron smithii), blue grama (Bouteloua gracilis) and needle-&-thread (Kuchler 1964). It is distinguished by a general prevalence of big sagebrush in minor quantities throughout the type. Other common species are prickly-pear (Opuntia), silver sagebrush, fringed sagewort (Artemisia frigida), and broom snakeweed (Gutierrezia sarothrae). A variety of grasses such as Sandberg's bluegrass, green needlegrass (Stipa viridula), bluebunch wheatgrass, plains reedgrass (Calamagrostis montanensis), junegrass and plains muhly and threadleaf sedge. Grama is generally well adapted to fire and can survive summer period fires and will normally reach preburn conditions in 2 years and can increase its coverage. Wheatgrass responds similarly while needle-and-thread is the most sensitive in this community and is generally killed when the above ground vegetation is consumed. It is a good seeder and can recover in 3 to 8 years to preburn levels. The type is confined to Montana east of the Continental Divide. It represents about 0.3 percent of the CRB and found in four of the Sections.

Wheatgrass-needle-&-thread-green needlegrass (CT16) - This is a type confined to Montana found east of the Continental Divide. It covers about 0.3 percent of the CRB and is limited to two Sections. It is a moderately dense, short or medium tall grassland composed of western wheatgrass, blue grama, needle-and-thread and green needlegrass. Large amounts of Sandberg's bluegrass and junegrass are normally present and bluebunch wheatgrass and threadleaf sedge are common. Shrubs are limited. Both needlegrasses are sensitive to fire damage with green needlegrass having a variable tolerance. Recovery is generally rapid for both species because of their seeding ability.

Wheatgrass-bluegrass (CT17) - A dense, low to medium tall grassland found in Washington, Oregon and northwestern Idaho. Minor amounts are also found in Montana and Nevada (Franklin 1973). Dominates are bluebunch wheatgrass and Sandberg's bluegrass. Shrubs and forbs are limited. It is the second most important grass type in the CRB covering a little over four percent of the area. It was found in five of the eight states and present in 14 of the Sections. 'The cover type is similar to CT14 except bluegrass is a major component. The type may represent a slightly less favorable moisture regime than CT14. The definition of this type and CT14 are somewhat ambiguous however, and application of the two types is not consistent among researchers. Bluegrass initiates its growth very early and commonly is in a dormant condition during the worst of the fire season however other major components are likewise fire resistant.

Needle & thread-wheatgrass-grama (CT20) - This is a very minor type which is more important to the east of the CRB. It is apparently very similar to CT15 with needle & thread the dominant grass. Other species are blue grama, western wheatgrass, dryland

sedges, bluegrasses, junegrass and plains reedgrass. Fringed sagewort and clubmosses (Lycopodium spp.) apparently were also present in the type. It was found in only trace amounts in one Section in Montana.

Tule marshes (CT82) - The type is composed of tall graminoid vegetation dominated by common tule (Scirpus acutus), California bulrush (Scirpus californicus), olney bulrush (Scirpus olneyi), tule (S. validus), cattail (Thpha domingensis), soft flag (T. latifolia) and samphire (Salicornia ambigua) on areas of very poorly drained or partially submerged soils Wieslander et al 1946). Typically the type is too small to map at the landscape level and while occurring in Oregon is only shown on the map in Nevada in two Sections. It normally is found along the shores of lakes in the Great Basin region and represents a little over 0.1 percent of the CRB.

Plains grass (CT86) - A general type described primarily for Wyoming composed of species such as grama grass, western wheat grass (Agropyron smithii), triple awn, June grass and three-leaved sedge along with bluebunch wheatgrass, rice grass (Oryzopsis), muhly, and blue grasses including plains bluegrass (Poa arida) (USDI, Geological Survey 1934a, 1934b). Needle-and-thread grass (Stipa comata) was also present in some stands. Scattered shrubs such as sagebrush, buck brush, bitter-brush, service berry, wild rose, wild currants (Ribes), buckthorn (Rhamnus), cinquefoil (Potentilla), and elderberry (Sambucus) were also present. The type was also found in Idaho and Nevada and found on 21 percent of the sections. It occupied about 0.6 percent of the CRB.

Alpine (CT10) - The type was found in four states and seven Sections representing about 0.6 percent of the CRB. The definition for the type is somewhat vague. Generally it represented areas above the limits of timber growth and contained short grasses, sedges and many forbs. Dominant species are bentgrass, sedges, fescue and bluegrass. In Yellowstone Park a type called alpine meadows & barren is probably the same type. Dominants in addition to those listed above are hairgrass, woodrush (Luzula), mountain timothy (Phleum alpinum) and spike trisetum (Trisetum spicatum). It is unclear if the areas of barren were small inclusions or if there were large areas lumped in with the vegetated area. Fire probably was of limited importance because of the sparse vegetation and limited period that the area was snow-free. Even though site conditions were harsh site recovery after fire was probably not a problem because of limited fuel buildup.

OTHER TYPES

This group is made up of a number of miscellaneous cover types which represented 1.1 percent of the CRB. Fire was not a concern in these types.

Barren (CT32) - Barrens was a term applied normally to high elevation areas too rocky, too exposed, or with limited soil resulting in sites not capable of supporting a vegetative cover of either trees, shrubs or herbs.. In surveys conducted in Oregon and Washington it also includes cities, towns, and unmeandered water surface but normally these areas were too small to be mapped. In some surveys this type was not recognized and areas were included in the surrounding types particularly the subalpine type (CT9) and alpine (CT10) . Areas large enough to map were confined to one Section in California. The type represents only a trace amount of the CRB.

Desert (CT85) - This type was found in Wyoming, Nevada and Utah and described as areas where vegetation is largely absent. In Wyoming it was described as a waste area (Deeds 1932). Unfortunately no additional information was provided. A similar area in Utah typed as desert by Kuchler was typed as Greasewood (CT56) by earlier reports (1964). No doubt vegetation was composed of only scattered grasses and shrubs found in the adjacent cover types with large areas of exposed ground. The type was identified in six Sections and represented about 0.6 percent of the CRB.

Water (CT26) - The type represented major bodies of water principally lakes. No area limitations were indicated, however small or moderate sized lakes commonly found at higher elevations in the mountainous terrain were apparently not included in most surveys. Reservoir or dams were not included. It represented less than 0.5 percent of the total area and was found in 11 Sections. While representing a small area it was one of the two types occurring in all 8 states found in the CRB.

SECTION DESCRIPTIONS

SECTION M242C

The Section is located on the east side of the Cascade Range between the Canadian boundary and Crater Lake in Oregon. Because of the wide variation in elevation and resultant climatic conditions a variety of forest cover types are included. Small inclusions of west side types can be found along the western boundary with western hemlock limited to this Section in the Columbia River Basin (CRB) . Along the eastern boundary inclusions of grass and desert shrub types add to the diversity and represent about 11 percent. The Section represents 5.5 percent of the CRB but it contained 19 cover types making it the second most diverse Section. (Complete descriptions of the cover types can be found in Appendix A.)

Table 1 - PERCENT ACRES BY COVER TYPE FOR SECTION M242C

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
1 - PP SAV	T	26 - WATER	0.6
2 - PONDEROSA PINE	42.8	27 - PINON-JUNIPER	0.1
3 - DOUGLAS-FIR	12.8	39 - NEEDLE- FES	1.4
5 - L-DF	0.8	41 - BITT-FES	0.3
6 - WHITE PINE	0.1	44 - OAK-MADRONE	0.1
7 - LODGEPOLE PINE	14.5	90 - WHITE FIR	0.1
9 - SUBALPINE	10.2	91 - FIR-MT. HEM	6.8
10 - ALPINE	2.8	93 - SITKA SPRUCE	0.7
13 - SAGE-GRASS	3.8	94 - HEMLOCK	0.1
14 - WHEAT-FESCUE	2.0		

Ponderosa pine represents almost 50 percent of the cover and was represented by open grown, mature stands found on the warmer and drier slopes. As much as six percent of the type was a savanna but because of map scale was not mapped. About 46 percent of the type was pure ponderosa pine. Colville (1898), describes conditions as low elevation forests primarily ponderosa pine with individual trees widely spaced with plenty of sunshine between them. Ground cover consists of bunch grass and scattered herbaceous plants and a very scattered undergrowth. Upslope stands are denser and contain Douglas-fir and white fir with ceanothus, manzanita and chinquapin (Castanopsis chrysophylla minor). Overmature stands dominated the age structure. Underburns were frequent and were important in maintaining the character of the stand and in many cases the dominance of ponderosa pine. On sites with a mixture of white fir and

Douglas-fir, stand replacement fires could occur with a very dense growth of shrubs following. Lodgepole pine was a common type intermixed with the pine on wetter sites or where frost pockets existed. As expected lodgepole pine stands were younger aged however the proportion of young, stands was significantly less than typically found in the Rocky Mountain area. Stands were dense with a limited understory of creeping manzanita (Arctostaphylos nevadensis) and waxy currant (Ribes cereum) with many areas bare of ground cover. Grass was limited. Fires were "extremely common" and double burns commonly created "fire glades". The Douglas-fir and white fir stands could burn during a dry season and following a double burn become brushfields. The mountain hemlock areas were usually open forests with huckleberries the major ground cover. Some high areas were devoid of underbrush. The Douglas-fir and grand fir stands were dense and usually contained a variety of tree species along with a dense undergrowth. The mid slope types represented by Douglas-fir, Larch-Douglas-fir and white fir were found on more mesic sites where partial burns or stand replacement fires were more common. Age structure suggests a moderate fire return period. Information on the age structure of the subalpine type was not available but was probably similar to the fir-mountain hemlock type. The bluebunch wheatgrass-bluegrass type was the most important grass. type. It was associated with the ponderosa pine cover type and had a similar fire frequency.

Gannett (1902a), describes the forests as open and light, ranging from about 3000 to 18000 board feet per acre. He estimated that about five percent of the forest was burned over when he examined it in 1899. An additional one percent was indicated as cut over associated with mining development and settlement which began in the 1860's.

Table 2 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M242C

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.7	2.8	13.6	15.3	67.6
DF	3.0	8.6	18.7	18.3	51.4
LP	1.5	5.9	36.6	43.0	13.0
P-MH	1.4	5.4	24.7	27.7	40.8
SSP	2.3	9.2	16.7	15.1	56.7
WH	2.6	10.3	16.9	14.7	55.5

In the Washington portion of this Section Gorman (1899) describes the ponderosa pine type as never dense and on dry sites scattered. Ponderosa pine made up about 85 percent of the tree cover with Douglas-fir representing about 12 percent and the

remaining area covered with other species The lodgepole pine type was very dense with very few shrubs. Gannett suggests that about seven percent of the area east of the Cascades was cutover by 1900 and three percent was burned over.

TABLE 3 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	2.1	30.3				17.1	50.5
DF	7.3	20.6	20.7			25.7	25.7
LP	4.5		39.5	38.8	10.7	6.5	
F-MH	14.1		27.4	13.8	13.9	40.8	
SSP	6.9		21.3		15.1	56.7	
WH	7.8		22.0	7.3	7.4	55.5	
SUB	10	5	5	20	30	25	5
P-J	25	25			10		40
O-MAD	10	15	10				65

* See Appendix C for descriptions and definitions.

TABLE 3A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
ALP		100					
13	70		30				
14	80	20					
39		50	50				
41		60	40				

SECTION M261D

This Section is located in the extreme southwest corner of the CRB and is transitional between eastside and westside forest conditions. It extends from near Crater Lake in Oregon to Redding, California. Eighteen cover types occurred in the Section with about 74 percent composed of forest types. In contrast to the previous Section ponderosa pine represents only about one quarter of the forest cover with mesic communities more prominent. As much as three percent of the type may have been a savanna with 38 percent considered a pure type. Since mixed types were more common fire, intensity was greater and the

opportunity for a partial burn was more likely. Jeffery pine along with sugar pine were important components in the ponderosa pine type but were not segregated in the original data. The pine-Douglas-fir-fir type occupied about 20 percent of the Section and represented mixtures of the ponderosa pine and Douglas-fir cover types. The Douglas-fir type represented about 10 percent of the Section and was more characteristic of the west coast fir type. Spruce-fir was common on upper slopes with only minor areas of lodgepole pine. The white fir and fir-mountain hemlock type were more common in California. A significant area contained chaparral or oak-madrone types. These types appear to be more common to the west and south of the CRB. This is the only Section in which the chaparral type was mapped. The grass and sagebrush-grass types were found primarily on the eastern boundary and are transitional to the non-forest areas to the east.

Gannett (1902a) describes the Section as impacted by fire with some townships 25 percent or more burned over in 1899. He indicates that some of the burns are the result of recent settlement but also that many of the burns were from before the arrival of Euro-American man. Upper slopes were especially impacted with large expanses of lodgepole pine restocking them. Some of the high elevation burns he indicated were not restocked but covered by grass. On mid slopes, brush fields were also common particularly on moist ponderosa pine sites.

Table 4 - PERCENT ACRES BY COVER TYPE FOR SECTION M261D

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
1 - PP SAVANNA	0.7	26 - WATER	0.3
2 - PONDEROSA PINE	23.8	27 - PINON-JUNIPER	3.6
3 - DOUGLAS-FIR	10.2	32 - BARREN	1.0
7 - LODGEPOLE PINE	1.2	43 - CHAPARRAL	2.3
8 - SPRUCE-FIR	12.6	44 - OAK-MADRONE	4.5
9 - SUBALPINE	0.1	47 - DESERT SHRUB	0.1
10 - ALPINE	0.1	53 - P-DF-F	21.8
13 - SAGE-GRASS	10.7	90 - WHITE FIR	1.7
14 - WHEAT-FESCUE	3.5	91 - FIR-MT. HEM	1.8

By 1900 little timber activity had occurred in Oregon but portions of California had experience heavy impacts since the 1850's associated with mining activity. By 1869 there were 251 sawmills in the state and it ranked 10th in the nation in production. As a result of this early activity age structure and to some extent cover type for this area may not be a true

reflection of the original vegetation.

Table 5 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M261D

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	2.6	10.6	17.7	13.7	55.4
DF	5.2	8.8	17.7	17.2	51.1
LP	0.6	1.8	44.8	45.1	7.7
P-DF-F	0.7	4.6	14.0	12.0	68.7
S-F	0.4	2.8	11.0	12.7	73.1
F-H	1.8	4.1	27.4	31.1	35.6
WF	2.6	5.0	40.6	36.2	15.6

The ponderosa pine age structure had more younger aged stands and less overmature stands than average for the CRB showing the influence of more partial burns on the mesic sites. Douglas-fir on the other hand contained significantly more overmature type with less young aged stands suggesting more similarity with west coast types. Spruce-fir shows a similar pattern.

SECTION M261D

TABLE 6 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	7.9	36.7				27.7	27.7
DF	9.6	19.6	19.7			25.6	25.5
LP	1.5		45.7	37.7	11.3	3.8	
P-DF-F	3.0	7.6	14.7	6.0		51.5	17.2
S-F	1.8		12.4	6.4	6.3	73.1	
F-H	3.8		29.6	15.6	15.5	35.6	
WF	5.1		43.1	18.1	18.1	15.6	
SUB	10	5	5	20	30	25	5
P-J	25	25			10		40
O-MAD	10	15	10				65

* See Appendix C for descriptions and definitions.

TABLE 6A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
ALP		100					
13	70		30				
14	80	20					
32	100						
43			60	25	10		5
47	20		80				

SECTION M261G-1

This is a small outlier of the main M261G Section and is located southwest of Silver Lake, Oregon. It covers the lower portion of the forested type and the contact with the grass and desert shrub types. About four percent of the area was historically ponderosa pine savanna type but not mapped. Data suggest that 85 percent of the type was considered pure ponderosa pine. Age structure is typical for the very dry open grown ponderosa pine. Periodic beetle outbreaks associated with extended dry periods may have been the major cause of mortality in these stands. Early reports suggest that sagebrush was limited at least on portions of the area shown as this cover type in 1930. The high fire frequency associated with the ponderosa pine cover type was probably a major deterrent to sagebrush development and it probably was confined to moist bottoms or patches missed by the last fire.

Table 7 - PERCENT ACRES BY COVER TYPE FOR SECTION M261G-1

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	79.1	14 - WHEAT-FESCUE	5.0
13 - SAGE-GRASS	15.9		

While there was local use of wood products for development of the ranching community starting about the 1870's, it was not until the 1930's that logging became an important industry in the area.

Table 8 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M261G-1

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.4	1.7	13.4	15.8	68.7

TABLE 9 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	W REI	YF-MST	OF-MST	OF-SS
PP	1.2	30.1				6.9	61.8

* See Appendix C for descriptions and definitions.

TABLE 9A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	70		30				
14	90	10					

SECTION M261G-2

The Section is located in northeastern California and extends into Oregon and includes the area between Klamath Falls and Lakeview. There were eight cover types identified with about one third of them forested with a majority of the remaining area in a sagebrush-grass type. Ponderosa pine was the major forest cover type with the western portion of the Section supporting a minor amount of more mesic types. Probably about four percent of the pine type was considered a savanna and 40 to 60 percent a pure ponderosa pine type. The sagebrush-grass type probably has undergone some change since settlement as a result of domestic stock grazing and fire exclusion. The type adjacent to the forest was dominated by grasses with Idaho fescue, squirrel-tail, Sandberg's bluegrass, and bluebunch wheatgrass common components. Sagebrush was found in patches or areas missed by the last major fire period. Species found were big sagebrush, low sagebrush and silver sagebrush.

Table 10 - PERCENT ACRES BY COVER TYPE FOR SECTION M261G-2

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	28.1	26 - WATER	2.5
7 - LODGEPOLE PINE	T	27 - PINON-JUNIPER	15.2
10 - ALPINE	0.2	47 - DESERT SHRUB	3.1
13 - SAGE-GRASS	47.4	53 - P-DF-F	3.5

The pinyon-juniper type was principally western juniper with an understory of sagebrush. Along the eastern edge of the Section in the more arid basins the desert shrub type becomes important. Major components were saltbush, desert saltgrass, black greasewood along with other alkali tolerant plants. In the

Klamath and Goose Lake areas are areas of tule marsh (82) cover type however this type was not large enough to map at this scale. Age structure associated with the various cover types is similar to that found in the adjacent sections indicating a similar disturbance regime.

Table 11 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M261G-2

COVER TYPE	NON - STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.8	4.2	15.4	13.9	65.7
P-DF-F	0.7	4.6	14.0	12.0	68.7
LP	0.2	1.0	39.0	49.3	10.5
F-MH	0.4	1.8	26.1	31.5	40.2

TABLE 12 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
TYPE	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	2.9	31.4				16.4	49.3
P-DF-F	3.0	7.6	14.7	6.0		51.5	17.2
LP	0.7		39.5	42.2	12.3	5.3	
F-MH	1.3		27.0	15.8	15.7	40.2	
P-J	25	25			10		40

* See Appendix C for descriptions and definitions.

TABLE 12A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	RANGE STRUCTURAL DEVELOPMENT STAGES*						
TYPE	21	22	23	24	25	26	27
ALP		100					
13	70		30				
14	80	20					
47	20		80				

SECTION 331A

This Section is a grass and shrub dominated landscape situated in the Palouse Prairie of eastern Washington and western Idaho. There are 11 cover types in the Section with non-forest types representing 81 percent of the area. The principle forest cover

was ponderosa pine with some minor inclusions of upland types along the eastern boundary of the area. An estimated six percent of the pine type may have been a pine savanna and 64 percent considered a pure ponderosa pine type. The fescue-snowberry type was the major cover type and represents the mesic portion of the grassland types. The wheatgrass-fescue type represented about 30 percent of the area however portions of this type may have been wheatgrass-bluegrass which appears to be transitional in this Section. Bluegrass appears in both communities as does wheatgrass.

Development of the area began very early compared to most of the CRB. A sawmill was constructed in the 1840's for use at one of the Indian missions. By the 1870's much of the area was settled with numerous small mills appearing to provide for local wood needs. The grasslands were initially used for grazing lands but with the settlement during the 1870's much of this type was developed for agricultural purposes.

Table 13 - PERCENT ACRES BY COVER TYPE FOR SECTION 331A

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	14.2	14 - WHEAT-FESCUE	29.3
3 - DOUGLAS-FIR	1.1	17 - WHEAT-BLUE	7.9
5 - L-DF	1.2	37 - FES-SNOW	41.8
6 - WHITE PINE	1.9	38 - FES-ROSE	1.8
8 - SPRUCE-FIR	0.8	90 - WHITE FIR	T
9 - SUBALPINE	T		

Table 14 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 331A

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	5.2	7.7	24.2	28.5	34.4
DF	46.5	11.9	15.4	18.6	7.6
L-DF	10.2	18.1	25.4	16.6	29.7
WP	22.3	23.7	20.2	14.0	19.8
S-F	33.4	3.3	11.4	27.5.	24.4
WF	0.1	0.5	26.6	32.9	39.9

Age structure within this section was significantly different than found elsewhere in the CRB. For example ponderosa pine

showed only about half of the normal amount in the overmature class. While efforts were made to account for past cutting activity this structure may be the result of the very early cutting that occurred in the area. It could also reflect a more severe fire regime particularly in the ponderosa pine type as a result of the shrub component found on these sites. While past harvest may have influenced the age structure there is no indication that the activity was to the level necessary to result in the modification noted.

TABLE 15 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
TYPE	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	9.0	56.6				8.6	25.8
DF	52.5	20.0	19.9			3.8	3.8
L-DF	19.2		42.8	8.3		22.3	7.4
WP	34.2		39.0	7.0		19.8	
S-F	35.0		13.0	13.8	13.7	24.4	
WF	0.3		26.9	16.4	16.5	39.9	
SUB	35	5	5	15	20	15	5

* See Appendix C for descriptions and definitions.

TABLE 15A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	RANGE STRUCTURAL DEVELOPMENT STAGES*						
TYPE	21	22	23	24	25	26	27
14	80	20					
17	85	15					
37		90		10			
38		90		10			

SECTION M331A

Section M331A covers the northwest corner of Wyoming including Yellowstone National Park. There were 18 cover types described for the section with forested types representing about 70 percent of the area. As expected the lodgepole pine type provided the majority of the coverage. It is followed by spruce-fir and subalpine types which also contain significant amounts of lodgepole pine. Types 61 and 64 are mixtures of these types plus the Douglas-fir type that were too small to map individually. This Section is one of two Sections in which these types are defined. The wheatgrass-fescue type was found on dry mountain slopes and valleys. Portions of the type represent small

inclusions of high meadow complexes or wet meadow types along the major drainages. The sagebrush-grass type represents the eastern portion of the Snake River complex and occurred in small dry valleys in the park area. Because of the relatively long period between major fires in this Section, sagebrush was a major component in the type. The Section represents one of two Sections where the willow type was mapped. While this type is common throughout the CRB it normally occurs in small units or was not defined by early vegetation work. Brandegee (1899b) describes the Upper Yellowstone Valley as open or covered with willow brush. While antidotal information is available that describes vegetation structure, limited data was collected prior to 1940 that provides a detailed description or age structure. A map of the Yellowstone Park prepared in 1945 provides a detailed mapping of cover types however definitions for the types and age information was limited. The portion in Montana was mapped in the Forest Survey that was conducted in the 1930's but detailed age information was not developed until the 1950's. The Montana portion was described as 40 to 50 percent burned over in 1885 with up to 25 percent additional in young trees and brush (USDA, Forest Service 1889). In Wyoming the Teton Forest Reserve was described as being dominated by lodgepole pine with spruce-fir mixtures in the basins (Brandegee 1899a). Much dead timber was noted but it was unclear if it was the result of past fire or insect activity. Numerous burns were mentioned and generally indicated as small in size however, one fire was noted that was four miles by five miles in size. Fires were described as not as frequent or destructive in the park. (Brandegee, 1899b). He also states however that a large proportion of the area has been burned within a generation and little has escaped fires at some time in the past. In Idaho a report of 1910 suggests that most of the Douglas-fir type was very open with shrubs common (Dunston). Extensive areas were in various stages of recovery from past fires however blocks of Douglas-fir and lodgepole pine cover types had not burned for long periods. In portions of the overmature lodgepole pine cover type beetle activity was estimated to have killed up to 15 percent of the trees.

The age structure of this Section is somewhat different than most areas in that the lodgepole pine type contains a higher percentage of overmature stands than does the Douglas-fir cover type. This difference is partially explained by the large plateau of lodgepole pine cover type that comprises a major portion of Yellowstone Park. Here the fire frequency is significantly longer for the lodgepole pine type than is found in the surrounding areas of more broken terrain where Douglas-fir is more common. The moist high basins also show a very long fire return interval in the age structure of the spruce-fir type. Information suggests that whitebark pine, Engelmann spruce and subalpine fir were the major species in subalpine type with the age structure similar to the spruce-fir type.

Table 16 - PERCENT ACRES BY COVER TYPE FOR SECTION M331A

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	6.3	17 - WHEAT-BLUE	0.6
7 - LODGEPOLE PINE	36.1	26 - WATER	1.3
8 - SPRUCE-FIR	14.0	54 - MT BRUSH	0.5
9 - SUBALPINE	13.6	56 - GREASEWOOD	3.9
10 - ALPINE	5.8	61 - LP-S-AF	1.2
13 - SAGE-GRASS	3.0	64 - DF-LP-S	0.1
14 - WHEAT-FESCUE	8.3	69 - WILLOW	0.3
15 - WHEAT-N&T-GRA	4.2	83 - BRIS-LIMP	0.2
16 - WHEAT-N&T-GN	0.1	85 - DESERT	0.5

The first mill was established about 1864 but logging had little impact on vegetation until 1883 with the construction of the Northern Pacific Railroad. Timber use was limited to local use and railroad ties prior to 1900.

Table 17 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M331A

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	9.5	27.0	40.6	15.9	7.0
LP	3.2	17.7	18.3	28.3	32.5
S-F	0.5	3.0	2.4	30.2	63.9

TABLE 18 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT' STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	23.0	35.0	35.0			3.5	3.5
LP	12.0		27.2	37.5	7.1	16.2	
S-F	2.0		3.9	15.1	15.1	63.9	
SUB	15	5	5	20	20	25	10
B-L	15	35			10		40

* See Appendix C for descriptions and definitions.

TABLE 18A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
ALP		100					
13	60		40				
14	80	20					
15	25	75					
16	25	75					
17	80	20					
54			90		10		
56	10		90				
69	20			50			30
85	50		50				

SECTION M331D

This Section includes the Tetons and the extreme southeast corner of Idaho. There are 17 cover types with lodgepole pine the major cover type followed by spruce-fir and Douglas-fir. Major valleys were dominated by the sagebrush-grass type with grasslands along the contact with the forest cover types. Types such as aspen and mountain brush which are common further south and east were present. Much of the aspen occurred as small groves scattered along the eastern boundary of Idaho. The basin at Jackson Hole was described as a scanty growth of sagebrush interspersed with grass (Brandegee 1899a). Willows were found in the wet areas and cottonwood along the streams. The portion in Idaho contained significant areas described in 1910 as brush covered with stands of immature Douglas-fir and lodgepole pine (Dunston). Aspen also was common with young Douglas-fir coming in under it. At low elevations the Douglas-fir type consisted of very open stands of mature or overmature trees over an extremely dense cover of brush (Ceanothus velutinus). Upper slopes graded into lodgepole pine with extensive areas of brush. Lodgepole pine stands tend to be immature. The sagebrush-grass type was the most important non-forested type and represented the eastern extension of the Snake River Plains sagebrush community,. It was generally confined to the valley bottoms of streams leading toward the Snake River. The wheatgrass-bluegrass type was found between the sagebrush bottoms and the forested communities.

The southern portion of the Section was some of the earliest area settled in Idaho and early exploitation occurred on much of the timber resource. The small outlier blocks of timber along the boundary between Utah and Idaho were cutover prior to 1900. In

Utah only minor amounts of forest are present in the Section and by 1885 much of this had been cut for local use.

Table 19 - PERCENT ACRES BY COVER TYPE FOR SECTION M331D

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	12.4	17 - WHEAT-BLUE	7.2
7 - LODGEPOLE PINE	27.5	26 - WATER	0.4
8 - SPRUCE-FIR	15.7	27 - PINON-JUNIPER	0.2
9 - SUBALPINE	0.4	54 - MT BRUSH	0.6
10 - ALPINE	1.1	56 - GREASEWOOD	0.1
12 - RIPARIAN	1.2	61 - LP-S-AF	0.8
13 - SAGE-GRASS	27.6	69 - WILLOW	T
14 - WHEAT-FESCUE	0.4	74 - ASPEN	4.4
15 - WHEAT-N&T-GRA	T		

The age structure developed for the Section appears to fit the description of the area with a high percentage of the Douglas-fir type in an unstocked condition. Lodgepole pine as in M331A contains a significant amount of overmature stands which is uncharacteristic for most of the Rocky Mountain area in the CRB.

Table 20 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M331D

COVER TYPE	NON-STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	8.7	16.0	12.4	21.6	41.3
LP	2.0	10.6	12.7	29.7	45.0
S-F	0.9	3.8	7.1	30.8	57.4

TABLE 21 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
TYPE	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	16.7	21.0	21.0			20.6	20.7
LP	7.3		18.0	44.8	7.3	20.6	
S-F	2.8		9.0	15.4	15.4	57.4	
SUB	10	5	5	20	30	25	5
P-J	35	30			15		20
ASP	5		70	25			
RIP	5		25		25	40	5

* See Appendix C for descriptions and definitions.

TABLE 21A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	RANGE STRUCTURAL DEVELOPMENT STAGES*						
TYPE	21	22	23	24	25	26	27
ALP		100					
13	60		40				
14	80	20					
15	25	75					
17	80	20					
54			90		10		
56	10		90				
69	20			50			30

SECTION M331J

The Section is made up primarily of the Wind River Range in Wyoming and contains seven cover types of which 85 percent are forested. Lodgepole pine and spruce-fir types were the major vegetation communities. Upper slopes were generally open and mapped as alpine type. A fringe of grass and shrub cover types can be found at the base of the range and represent inclusions of plains communities to the east of the CRB. Forest conditions were very similar to those found in M331A and M331D. A major burn occurred about the time of settlement (1870's) near Lander. In 1925 it was described as containing enough forest growth to provide watershed protection and apparently the burn was spotty or mixed (USDA, Forest Service 1927). The lodgepole pine type was described as dense and tended to be pure and evenaged. The spruce-fir type tended to be of mixed age and species with a

considerable amount of underbrush.

Table 22 - PERCENT ACRES BY COVER TYPE FOR SECTION M331J

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
7 - LODGEPOLE PINE	39.0	14 - WHEAT-BLUE	3.1
8 - SPRUCE-FIR	32.7	15 - WHEAT-N&T-GRA	5.1
10 - ALPINE	13.5	86 - PLAINS GRASS	4.8
13 - SAGE-GRASS	1.8		

Table 23 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M331J

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
LP	1.9	11.4	8.4	32.3	46.0
S-F	0.4	2.8	2.1	30.4	64.3

TABLE 24 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
LP	7.6		14.1	47.2	8.1	23.0	
S-F	1.8		3.5	15.2	15.2	64.3	

* See Appendix C for descriptions and definitions.

TABLE 24A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
ALP		100					
13	60		40				
14	80	20					
15	25	75					
86	25	75					

The narrative description presents a picture of somewhat younger aged stands than that developed from the age classification for lodgepole pine. The 1914 classification report for the Washakie Forest states the past fires have depleted stands with many young stands present and some that show repeated burning (USDA, Forest

Service 1914). This analysis showed about 10 percent of the timber areas burned over.

SECTION M332A

This Section is found in north central Idaho between the Lochsa River and the edge of the Snake River Plains. The Salmon River flows through the middle of the Section. Twelve cover types were defined for the Section with forest types representing 91 percent. Information for the area north of the Salmon River is quite complete both from early surveys and detailed analysis during the 1930's. The portion south of the Salmon is less detailed and data came from a number of surveys conducted between 1908 and the 1950's. Typing of the ponderosa pine savanna was inconsistent among surveys and it may have represented a larger portion of the area. About 43 percent was typed as a pure ponderosa cover. North of the Salmon River the Douglas-fir type was less important and there was a significant acreage that was typed as hemlock-white fir in the county data. This type however was washed in with surrounding types at the landscape level mapping. Other types of smaller acreage include the white pine, western red cedar and cedar-white fir types found in small isolated stands. Timber harvest associated with mining activity began in the 1860's but major activity did not begin until after 1900. South of the Salmon River the forest cover type diversity becomes less with the loss of white pine and western hemlock. 'Other than logging associated with mining activity in the 1860's impacts on the forested types began in the 1880's with the settlement of the valleys. Major logging activity began after 1900.

Table 25 - PERCENT ACRES BY COVER TYPE FOR SECTION M332A

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
1 - PP SAVANNA	0.1	8 - SPRUCE-FIR	6.6
2 - PONDEROSA PINE	20.7	9 - SUBALPINE	14.6
3 - DOUGLAS-FIR	27.2	13 - SAGE-GRASS	0.5
4 - DF SAVANNA	0.2	17 - WHEAT-BLUE	8.5
5 - L-DF	0.8	26 - WATER	0.2
7 - LODGEPOLE PINE	20.6	37 - FES-SNOW	T

Age structure of all types suggests a fire regime with more partial and stand replacement type burns. This shift appears to occur also in the ponderosa pine type. Early descriptions of the forests especially south of the Salmon River suggest that many Of the ponderosa pine sites had significant amounts of shrubs and in some cases they were described as dense. Shrubs were also important in the Douglas-fir, larch-Douglas-fir and spruce-fir

types.

Table 26 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332A

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	6.1	2.7	9.6	23.4	58.2
DF	15.7	9.8	27.9	28.4	18.2
L-DF	15.7	19.7	15.8	28.0	20.8
LP	17.7	34.9	35.1	9.2	3.1
S-F	28.6	3.6	18.0	27.2	22.6

TABLE 27 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	W REI	YF-MST	OF-MST	OF-SS
PP	7.4	34.4				29.1	29.1
DF	20.6	30.6	33.6			9.1	9.1
L-DF	25.6		39.6	14.0		15.6	5.2
LP	35.2		52.6	3.4	2.3	1.5	
S-F	30.4		19.8	13.6	13.6	22.6	
SUB	40	5	5	10	15	15	10

* See Appendix C for descriptions and definitions.

TABLE 27A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	90		10				
17	80	20					
37		90		10			

SECTION M332B

The Section represents a transition zone between the Pacific Maritime zone of northwest Montana and northern Idaho and the Continental climatic zone east of the Continental Divide. There were only seven cover types described for the area and 79 percent were forest types. Species associated with the Pacific Coast forests including white pine, grand fir and western red cedar, reach their southeastern limits. Western larch also reaches its

range limit in this Section. Lodgepole pine is the dominant cover type followed by Douglas-fir and the subalpine types. Lodgepole pine is commonly a major species in both of these cover types. Ponderosa pine was confined to the lower slopes and valleys with a large portion in the main valleys a pure stand' with some of the type originally a savanna type. The wheatgrass-fescue type was common in the major valleys. On the drier sites bluebunch wheatgrass and rough fescue along with varying amounts of needle-and-thread and junegrass were common. Moister sites contained more rough fescue and Idaho fescue became important. Big sagebrush was probably a scattered shrub in the type. Settlement began in the 1840's with major development occurring in the 1880's with the arrival of the Northern Pacific Railroad. By the 1890's major portions of the Clark Fork and Bitterroot valleys had been logged.

Table 28 - PERCENT ACRES BY COVER TYPE FOR SECTION M332B

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	15.8	8 - SPRUCE-FIR	0.1
3 - DOUGLAS-FIR	16.3	9 - SUBALPINE	14.4
5 - L-DF	4.0	14 - WHEAT-FESCUE	21.4
7 - LODGEPOLE PINE	28.0		

Overmature stands were common in the ponderosa pine, larch-Douglas-fir and spruce-fir cover types. At the other extreme lodgepole pine type contained 40 percent in stands less than 40 years of age and only three percent in the overmature category.

Table 29 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332B

COVER TYPE	NON-STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	**4.0**	10.0	**7.5**	**11.4**	**67.1**
DF	**4.2**	**18.2**	**31.0**	**22.7**	**23.9**
L-DF	**2.2**	**21.1**	11.5	15.5	49.7
LP	9.3	**33.6**	**43.1**	10.8	**3.2**
S-F	0	0.1	19.5	**23.5**	**56.9**

TABLE 30 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	9.0	23.9				33.6	33.5
DF	13.3	31.4	31.4			11.9	12.0
L-DF	12.8		29.7	7.8		37.3	12.4
LP	26.1		59.9	9.7	2.7	1.6	
S-F	0.1		19.5	11.8	11.7	56.9	
SUB	30	5	5	10	20	20	10

* See Appendix C for descriptions and definitions.

TABLE 30A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
14	80	20					

SECTION M332C

Section M332C is situated in Montana east of the Continental Divide from the Canadian border south to the Missouri River. Six cover types were mapped in the Section with about 90 percent timbered. A fringe of plains grasslands occurs along the eastern boundary. Some of the most extensive aspen groves in the state along with stands of limber pine (Pinus flexilis) are common along the lower slopes of the mountains but are not mapped at this scale. Intensive surveys were not undertaken until the 1950's and descriptive information is limited. The major cover type was found in the subalpine zone in which whitebark pine was a major species.. Age and stand structure data was not available for the type. Lodgepole pine was the other major cover type with the remainder of the forest vegetation associated with moist spruce-fir pockets or dry foothills where Douglas-fir occurred. The lower foothills were covered with the wheatgrass-fescue type. This type was very common to the west and this Section represents its most northeastern extension. On moist sites it was dominated by rough fescue, needlegrasses and mountain brome with groves of willows and shrubby aspen. On drier sites rough fescue, bluebunch wheatgrass and Idaho fescue dominated. At the contact with the plains needle-and-thread and junegrass were important along with bluebunch wheatgrass. All of these sites contained scattered sagebrush. A minor inclusion of the needle-and-thread-wheatgrass-grama cover type occurred along the eastern boundary. Major species were needle-and-thread, western and thickspiked wheatgrass and green needlegrass. Silver sagebrush was a common shrub in the type. This type is more common in the plains area of

central Montana.

Table 31 - PERCENT ACRES BY COVER TYPE FOR SECTION M332C

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	3.8	9 - SUBALPINE	46.6
7 - LODGEPOLE PINE	37.7	14 - WHEAT-FESCUE	9.5
8 - SPRUCE-FIR	2.1	20 - N&T-WHEAT-GRA	0.3

Table 32 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332C

COVER TYPE	NON - STOCKED	SEED-S A P l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	7.2	23.0	41.1	15.4	13.3
LP	10.6	30.3	32.6	20.5	6.0
S-F	5.1	8.4	37.4	26.5	22.6

Major timber harvest occurred with the construction of the Great Northern Railway about 1892. Fire impacted all vegetation types with none of the forested types containing more than about 25 percent in an overmature condition. Major portions of the area were burned during the 1889 fire year.

TABLE 33 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	18.7	34.0	34.1			6.6	6.6
LP	25.8		47.7	18.4	5.1	3.0	
S-F	9.3		41.6	13.2	13.3	22.6	
SUB	30	5	5	10	15	20	15

* See Appendix C for descriptions and definitions.

TABLE 33A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
14	80	20					
20	25	75					

SECTION M332D

The Section is located in Montana east of the Continental Divide between the Missouri and Yellowstone River. Nine cover types are found in the Section with 42 percent of the area in forested types. A number of small isolated mountain ranges are found in the Section including the Big Belt, Little Belt, Big Snowey, Castle, Crazy and Bridger Mountains. Forest communities were confined to these prominent mountains. With the discovery of gold in the 1860's impacts began on the forested communities and by the 1890's most of the better stands had been logged. Leiberg' survey in 1904 suggested that 25 percent of the forested area was cut (1904b). This Section represents some of the most extensive ponderosa pine savanna mapped in the CRB. The wheatgrass-fescue type was found on the lower slopes of the mountain ranges and the rolling hills in the western portion of the section. Rough fescue, Idaho fescue and bluebunch wheatgrass were major components.

Table 34 - PERCENT ACRES BY COVER TYPE FOR SECTION M332D

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
1 - PP SAVANNA	2.7	13 - SAGE-GRASS	5.4
2 - PONDEROSA PINE	8.1	14 - WHEAT-FESCUE	45.7
3 - DOUGLAS-FIR	16.4	15 - WHEAT-N&T-GRA	0.5
7 - LODGEPOLE PINE	12.1	16 - WHEAT-N&T-GN	6.2
9 - SUBALPINE	2.9		

Along the north and eastern border of the Section was found the wheatgrass-needle-and-thread-grama type common in the central grasslands of Montana. Common species were bluebunch, western and thickspike wheatgrasses, and needle-and-thread. Big and silver sagebrush were often present. Sagebrush-grass becomes important on small areas with sagebrush a major part of the vegetation. A minor inclusion of the wheatgrass-needle-and-thread-grama type was found on the eastern edge of the Section. As noted in Section M332C, young aged stands made up a major portion of the forest cover. Because of the isolated nature of the mountain ranges, fires sweeping off the grasslands commonly ran upslope through them. Trees along the lower forest edge were commonly short and susceptible to crown damage resulting in a higher proportion of stand replacement fires. This factor appears particularly important in the ponderosa pine type where the lowest amount of overmature type is found in the CRB and the highest percentage of stands less than 40 years of age. The Douglas-fir and lodgepole pine types were also above average for the amount of stands less than 40 years of age and below average for overmature stands.

Table 35 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332D

COVER TYPE	NON-STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	**10.7**	**46.5**	**25.3**	10.9	**6.6**
DF	9.9	30.9	**34.2**	**13.5**	**11.5**
LP	11.8	**30.7**	**43.2**	10.5	**3.8**

TABLE 36 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	34.0	59.4					6.6
DF	25.4	31.6	31.5			5.7	5.8
LP	27.2		58.5	9.8	2.6	1.9	
SUB	40	5	5	10	15	15	10

* See Appendix C for descriptions and definitions.

TABLE 36A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	75	15	10				
14	70	30					
15	15	85					
16	15	85					

SECTION M332E

The southwest corner of Montana and the upper Salmon and Lemhi drainages in Idaho are identified as Section M332E. There were nine cover types mapped in the Section. Climatic conditions are cold and dry and on some exposures sufficient moisture in not available before timberline conditions are encountered and grasslands extend from the valley floor to the top of the mountain. Forest cover types were found on about 37 percent of the area with Douglas-fir and lodgepole pine about equally represented. Minor amounts of ponderosa pine type occurred in the area around Salmon, Idaho on southerly slopes. Douglas-fir stands were typically open mature stands on south slopes and ridge lines and dense younger aged on north and east slopes. Savanna types were found on westerly slopes in the Dillon, Montana area. Lodgepole pine occupied the upper slopes with

densities ranging from open grown conditions common on high elevation ridges or gentle slopes to dense thickets. Overmature stands were normally associated with the more gentle terrain and showed signs of periodic underburns. Conditions on the Idaho side of the section are similar to Montana. The Douglas-fir stands tended to be all aged and more open. The mixed ponderosa pine-Douglas fir stands commonly had the appearance of large scattered ponderosa pines with a denser stand of smaller Douglas-fir between. The spruce type is confined to a narrow strip along stream courses consisting of rather scattered trees or sometimes very dense stands. The sagebrush-grass type dominated the upper portions of the valleys in Montana and the valley bottoms in Idaho. The structure was a dense to open grassland with a variable shrub component. The density of the shrub portion was primarily dependent on the length of time since the last fire. Dominant species included bluebunch wheatgrass and big sagebrush. The wheatgrass-fescue type was primarily found in Montana in the lower portions of the drainages. This type was similar to other occurrences in the state with sagebrush usually scattered through the type. The wheatgrass-bluegrass type was found between the sagebrush-grass type in the valley and the forested slopes. The major difference between the two grass types was the abundance of Sandberg's bluegrass.

Table 37 - PERCENT ACRES BY COVER TYPE FOR SECTION M332E

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	0.3	9 - SUBALPINE	5.2
3 - DOUGLAS-FIR	15.9	13 - SAGE-GRASS	32.6
4 - DF SAVANNA	0.3	14 - WHEAT-FESCUE	17.0
7 - LODGEPOLE PINE	15.4	17 - WHEAT-BLUE	13.2
8 - SPRUCE-FIR	0.1		

The age structure for ponderosa pine suggests an overmature stand condition but also one in which the less than 40 year component was also moderately high for the type. Both the Douglas-fir and lodgepole pine types show the influence of partial and stand replacement fires at a relatively frequent interval. Even the spruce-fir type had limited overmature areas. This could be the result of its occurrence as narrow stringers in riparian areas with a relatively high fire interval type adjacent to it.

Table 38 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332E

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	6.8	5.4	1.5	11.4	74.9
DF	6.4	22.1	21.4	25.0	25.1
LP	10.9	40.9	39.7	7.5	1.0
S-F	1.0	2.8	41.9	21.7	32.6

TABLE 39 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
TYPE	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	9.5	15.6				18.7	56.2
DF	17.4	28.7	28.7			12.6	12.6
LP	31.4		60.2	6.0	1.9	0.5	
S-F	2.4		43.3	10.8	10.9	32.6	
S W	35	5	5	10	15	20	10

* See Appendix C for descriptions and definitions.

TABLE 39A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	RANGE STRUCTURAL DEVELOPMENT STAGES*						
TYPE	21	22	23	24	25	26	27
13	70	10	20				
14	80	20					
17	80	20					

SECTION M332F

The Section lies in central Idaho in which eight cover types were mapped. About 57 percent of the Section were forested. In 1926 it was described as "out of the way and difficult to reach.... the western portion of the forest (Challis) contain interesting stretches of little-known wild country in which big game is still to be found" (USDA, Forest Service 1926a). The general forest conditions were described as uneven aged stands with mature and overmature stands predominating which had considerable defect. Large areas had been injured by fire in the past (pre 1910) ranging from stand replacement to minor damage. The majority of the area was in the Douglas-fir cover type occurring in almost pure stands. Some lodgepole pine was mixed in on lower slopes

and subalpine fir at the upper limits of the type. Lodgepole pine occurred on the flats and benches again in pure stands. The spruce-fir type was confined to stream riparian zones and in the upper basins. The subalpine type was partially timbered with whitebark pine, spruce and subalpine fir. Aspen stands were common on the lower slopes and bottom land but were not large enough to map. The ponderosa pine type was confined to the north end of the Section in the Salmon River headwaters. The sagebrush-grass type was found in the main valleys while the wheatgrass-bluegrass type occupied the foothills.

Mining activity around Ketchum and other small developments resulted in some vegetative impacts in the 1860's. After 1870 heavy cutting occurred around Ketchum and by 1910 many of the lower slopes had been stripped of timber.

Table 40 - PERCENT ACRES BY COVER TYPE FOR SECTION M332F

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	0.8	9 - SUBALPINE	12.0
3 - DOUGLAS-FIR	34.9	13 - SAGE-GRASS	10.8
7 - LODGEPOLE PINE	7.7	17 - WHEAT-BLUE	32.2
8 - SPRUCE-FIR	1.6	85 - DESERT	T

Age structure for ponderosa pine shows less young aged stands than typical of the CRB and conversely more overmature type. The Douglas-fir type had less young aged stands than normal but the overmature class in about average. Both the lodgepole pine and spruce-fir types show below average for the overmature class but average for the young aged class.

Table 41 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332F

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.7	2.2	6.2	15.2	75.7
DF	2.8	9.3	29.3	36.9	21.7
LP	3.5	30.9	54.7	7.8	3.1
S-F	2.3	10.0	38.9	35.6	13.2

TABLE 42 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	1.8	22.5				18.9	56.8
DF	7.4	35.5	35.5			10.8	10.8
LP	18.9		70.2	7.4	2.0	1.5	
S-F	7.3		43.9	17.8	17.8	13.2	
SUB	25	5	5	10	20	20	15

* See Appendix C for descriptions and definitions.

TABLE 42A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	70	10	20				
17	80	20					
85	50		50				

SECTION M332G

The Blue Mountains of Oregon and Washington make up this Section with 14 cover types present. Forest types covered 48 percent of the Section. This area is dominated by ponderosa pine types that were commonly pure or almost pure types. As much as 10 percent of the type probably was a ponderosa pine savanna broken up in small units that were not mapped at this scale. These typically were along the transition between the forested types and the shrub or grassland types. Pure ponderosa pine stands occupied 65 percent of the pine type. These predominated on the lower elevations and graded into mixed stands on mid elevations and on north and east slopes. On these sites Douglas-fir, western larch and white fir were associates. Above the limits of ponderosa pine stands were dominated by mixtures of the other types but they represented less than 10 percent of the land area. Non-forested areas along the south and western portion of the Section were dominated by the sagebrush-grass type. Sagebrush and bluebunch wheatgrass were the major species. Idaho fescue and needlegrass were important in some sites. The extent of sagebrush coverage is somewhat difficult to determine as early investigators provided only general descriptions. It is apparent however that extensive areas of sagebrush were present and while it may be temporarily removed by fire was able to reseed and maintain a position in the stand. The wheatgrass-fescue type was found along the north and northwest portion of the Section while the wheatgrass-bluegrass was common on the eastern edge. Both these types contained various mixtures of bluebunch wheatgrass,

Idaho fescue and Sandberg's bluegrass. Shrubs generally played a minor role on these sites. The fescue-snowberry and fescue-rose types were minor areas found on the eastern side of the Blue Mountains and probably represent a finer breakdown of the larger grassland types. The pinyon-juniper type was found on the western edge of the Section and was dominated by juniper and sagebrush with a limited amount of the common grass species. Pinyon pine was not present in this broad type in this Section.

Table 43 - PERCENT ACRES BY COVER TYPE FOR SECTION M332G

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	36.9	13 - SAGE-GRASS	30.1
3 - DOUGLAS-FIR	3.2	14 - WHEAT-FESCUE	4.8
5 - L-DF	1.1	17 - WHEAT-BLUE	14.2
7 - LODGEPOLE PINE	1.9	27 - PINYON-JUNIPER	1.3
8 - SPRUCE-F1R	0.1	37 - FES-SNOW	0.1
9 - SUBALPINE	1.8	38 - FES-ROSE	0.9
10 - ALPINE	1.1	90 - WHITE FIR	2.5

The discovery of gold in the early 1860's resulted in the first impact on vegetation structure followed by the arrival of the railroad in the 1880's and the introduction of heavy livestock grazing. By 1900 impacts from these activities had begun to reshape the vegetation structure.

Table 44 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M332G

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	1.9	2.3	13.1	17.2	65.5
DF	5.1	14.4	30.5	17.0	33.0
L-DF	3.3	13.2	17.2	13.3	53.0
LP	4.1	16.3	31.7	29.7	18.2
S-F	1.3	3.7	28.4	43.0	23.6
WF	0.3	1.3	26.4	32.2	39.8

The ponderosa pine stands had less than average amount of young aged stands compared to the CRB. This trait was common on the adjacent Sections which were characterized by level or undulating topography and open stand with grass or low shrub understories. The overmature portion is about average for the CRB. The other

types also have less young age stands and a greater percentage of overmature stands. This condition may be the result of a number of factors such as a higher frequency of underburns or partial burns in these types coupled with more gentle topographic features when compared to the Rocky Mountain areas.

TABLE 45 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	3.0	31.4				13.1	52.4
DF	12.3	27.4	27.3			16.5	16.5
L-DF	9.9		30.4	6.7		39.8	13.2
LP	12.2		39.9	31.4	7.4	9.1	
S-F	3.2		30.2	21.5	21.5	23.6	
WF	1.0		27.0	16.1	16.1	39.8	
SUB	20	10	10	10	20	20	10
P-J	25	25			10		40

* See Appendix C for descriptions and definitions.

TABLE 45A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
ALP	10	90					
13	60	10	30				
14	80	20					
17	80	20					
37		90		10			
38		90		10			

SECTION M332G-2

This unit is a small outlier of Section M332G, lying to the west of the main Section. The sagebrush-grass cover type occupies the entire unit. The structure of the type is the same as found in the main portion of the unit.

SECTION M333A

This Section is located between the eastern slopes of the Cascade Range and the Kootenai River in the Idaho Panhandle. About 75

percent of the Section was in forest cover with ponderosa pine representing almost 40 percent of the total coverage. up to 14 percent of the ponderosa pine type may have been in a savanna condition particularly on the southwestern portion of the area. About half of the type was considered a pure ponderosa pine type with the remaining area in various mixtures with Douglas-fir, larch and grand fir. The white pine type was confined primarily to moist sites in Idaho and along the eastern boundary of Washington. Larch-Douglas-fir occurred in the same geographic area on warm, moist sites. Douglas-fir was found throughout the section on mid slope sites with the lodgepole pine type on higher sites and the spruce-fir on cool, moist environments. The' sagebrush-grass type was found in the extreme western portion primarily in the valley of the Okanogan River. The three-tipped sagebrush-fescue type occurred along the southern and southwestern border where it came in contact with the large grass and shrub types of interior Washington. The grasslands were found scattered throughout and were of limited occurrence. Settlement in the Spokane area began early and by the 1890's about half of the forested area in Spokane County had been cut over. Adjacent counties were also impacted.

Table 46 - PERCENT ACRES BY COVER TYPE FOR SECTION M333A

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	**38.0**	**13** - SAGE-GRASS	**5.4**
3 - DOUGLAS-FIR	9.2	14 - WHEAT-FESCUE	1.9
5 - L-DF	10.5	17 - WHEAT-BLUE	1.1
6 - WHITE PINE	9.2	26 - WATER	1.4
7 - LODGEPOLE PINE	1.8	37 - FES-SNOW	**2.6**
8 - SPRUCE-FIR	2.9	39 - STIP-FES	**12.2**
9 - SUBALPINE	**3.8**		

The age structure for ponderosa pine is similar to the average for the CRB although the amount of overmature type is less than average. Douglas-fir shows significantly more overmature type being double the average. Lodgepole pine had a slight increase in the amount of young age stands and the unit contained some of the greatest concentrations of overmature white pine found in the CRB.

Table 47 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M333A

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	3.7	9.6	10.0	23.9	52.8
DF	4.4	15.8	14.8	9.8	55.2
L-DF	12.1	19.7	12.7	8.4	47.1
LP	10.7	31.7	20.5	16.8	20.3
WP	10.6	15.2	8.1	10.0	56.1
S-F	3.2	15.6	15.7	16.8	48.7

TABLE 48 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	8.5	38.7				13.2	39.6
DF	12.3	16.2	16.3			27.6	27.6
L-DF	22.0		26.7	4.2		35.3	11.8
LP	26.6		36.4	22.7	4.2	10.1	
WP	18.2		20.7	5.0		56.1	
S-F	11.0		23.5	8.4	8.4	48.7	
SUB	30	5	5	10	20	20	10

See Appendix C for descriptions and definitions.

TABLE 48A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	50	10	30				
14	80	20					
17	80	20					
37		90		10			
39		50	50				

SECTION 333B

The Section occupies the area between Flathead Lake in Montana westward to the Kootenai River in northern Idaho and from

Missoula, Montana north to the Canadian border. While the area is dominated by the maritime climatic influence it is subject to intrusions of cold arctic air in the winter. As a result west coast species such as western hemlock are confined to the northwest corner of the section in coves and sheltered areas. Forested cover types are found on 80 percent of the area with the largest non-forest area found in the southwest portion by Flathead Lake. The larch-Douglas-fir type represented about half of the forest cover type and represents the best development of this type in the CRB. In the valley bottoms these stands were commonly dominated by open grown, mature to overmature larch with a second story of Douglas-fir, grand fir, lodgepole pine and other species found in the area. On steeper slopes larch tended to be younger in mixture with other species generally of the same age. While the more gentle terrain was maintained in a somewhat open condition by frequent underburns upper slopes were much more brushy and dense. Ponderosa pine was confined to the lower dry slopes usually in mixture with Douglas-fir or other species. The white pine type was found primarily in the northwest corner of the Section commonly growing in mixture with western red cedar, western hemlock, grand fir and other mesic species. The lodgepole pine type was scattered throughout the section on upper slopes and it graded into the subalpine type on the ridge tops. As usual the spruce-fir type was confined to riparian zones along streams or moist basins in the drainage heads. The wheatgrass-fescue type was the major non-forested type and occurred in the large valleys. Rough fescue, bluebunch wheatgrass and Idaho fescue were the major components. Some scattered big sagebrush was present on some sites. Development in this area was relatively late and significant timber harvest did not occur until the construction of the Great Northern Railroad in 1892. Large scale logging for export started about 1900.

Table 49 - PERCENT ACRES BY COVER TYPE FOR SECTION M333B

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	17.0	8 - SPRUCE-FIR	0.7
5 - L-DF	41.7	9 - SUBALPINE	6.7
6 - WHITE PINE	4.0	14 - WHEAT-FESCUE	17.0
7 - LODGEPOLE PINE	10.4	26 - WATER	2.5

Table 50 - AGE STRUCTURE IN 190'0 FOR MAJOR FOREST COVER TYPES IN SECTION M333B

COVER TYPE	NON-STOCKED	S E E D - POLES SAP l-40	41-100	MATURE 101-150	OVER MATURE 151+
PP	5.9	11.0	11.9	7.1	64.1
DF	15.1	22.0	13.0	13.2	36.7
LP	27.3	44.7	19.2	6.8	2.0
WP	23.3	26.0	9.1	9.2	32.4
S-F	2.9	7.2	5.9	23.5	60.5

All of the types except the spruce-fir type show a considerable amount of area less than 40 years of age. Lodgepole pine and ponderosa pine contained twice as much as the average for the CRB. This structure could be the result of the widespread fires of 1890 which affected a major portion of this Section. Other than lodgepole pine the overmature portion for the types is about average. Lodgepole pine is significantly below average.

TABLE 51 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	11.4	2 4	. 5			16.0	48.1
DF	26.1	18.6	18.6			18.4	18.3
LP	49.6		41.6	6.1	1.7	1.0	
WP	36.3		26.7	4.6		32.4	
S-F	6.5		9.5		23.5	60.5	1
SUB	40	5	5	5	10	15	20

* See Appendix C for descriptions and definitions.

TABLE 51A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
14	80	20					

SECTION M333C

The Section includes the area between Flathead Lake and the Continental Divide and from the Canadian boundary south to the Missoula, Montana area. The north end of the Section is under the influence of the maritime climate however occasional

movements of arctic air can invade the area during the winter months resulting in death or frost damage to the sensitive species associated with the maritime climate. As a result these species were confined to protected areas or sites influenced by Flathead Lake. Other than some inclusions of grass type on the south boundary of the Section the area was covered with forest vegetation. The major type was larch-Douglas-fir which occupied the valleys and lower to mid slope positions. Lodgepole pine was a close second and was found on slopes above the larch-Douglas-fir type. There was an area between these two types where dominance shifted back and forth depending of fire severity and seed production of larch. Spruce-fir was found on moist benches, riparian areas and high basins. White pine was located in protected areas and included an array of species such as western red cedar and grand fir. Ponderosa pine was found mainly near the southern boundary of the Section or on dry southwest slopes. Douglas-fir was found on cool, dry sites generally above the limits of ponderosa pine. The wheatgrass-fescue type was found on the southern boundary and dominated by rough fescue, bluebunch wheatgrass and Idaho fescue. Little sagebrush occurred in this type. The arrival of the Great Northern Railway in 1892 had the first major impact on the forested areas particularly adjacent to the right-of-way. By 1900 major logging for export was underway.

Age structure for the larch-Douglas-fir shows slightly less percentage in the young aged class and a greater percentage of overmature stands. This is probably the result of the extensive stands in the Valleys of the Swan and Clearwater drainages where they take on the appearance of open grown ponderosa pine stands with frequent underburns.

Table 52 - PERCENT ACRES BY COVER TYPE FOR SECTION M333C

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	0.8	7 - LODGEPOLE PINE	27.1
3 - DOUGLAS-FIR	0.4	8 - SPRUCE-FIR	6.4
5 - L-DF	28.4	9 - SUBALPINE	36.4
6 - WHITE PINE	0.5	14 - WHEAT-FESCUE	T

Douglas-fir and lodgepole pine both show the impact of stand replacement fire with lodgepole pine containing a significantly greater percentage in young stands and Douglas-fir having significantly less overmature class.

Table 53 - **AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN**

SECTION M333C

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	1.7	11.4	'5.9	2.9	78.1
DF	1.8	23.9	38.6	24.4	11.3
L-DF	9.8	13.1	9.9	15.0	52.2
LP	20.7	37.6	28:8	9.0	3.9
WP	0	1.1	28.5	40.4	30.0
S-F	2.4	3.5	8.7	25.7	59.7

TABLE 54 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	7.4	14.5				19.5	58.6
DF	13.8	37.5	37.5			5.6	5.6
L-DF	16.4		24.0	7.5		39.1	13.0
WP	0.6		49.2	20.2		30.0	
S-F	4.2		10.4	12.8	12.9	59.7	
SUB	20	5	5	10	20	20	20

* See Appendix C for descriptions and definitions.

TABLE 54A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
14	80	20					

The spruce-fir type showed a similar pattern to the larch-Douglas-fir which is difficult to explain considering the fire impact on Douglas-fir and lodgepole pine.

SECTION M333D

This is a large area occupying the central portion of north Idaho and western Montana. The Section lies between the Lochsa River north to Coeur d'Alene Lake and from the Paluse Prairie east to the Clark Fork River in Montana. The area is dominated by the maritime climatic influence with moderate temperatures and adequate moisture on most sites except high energy south and west

slopes. Forested vegetation represents 97 percent of the area. The non-forest type was found on the western boundary and represents inclusions from the Paluse Prairie area. The core of the area was dominated by the white pine type and probably represented some of the type's best development. Stands were generally not pure stands but mixtures of all of the other species found in the area. Ponderosa pine was found mainly along the western boundary at low elevations or along the eastern boundary in the Clark Fork Valley. These stands ranged from savannas to pure ponderosa pine to mixtures with Douglas-fir, larch and grand fir. The larch-Douglas-fir type was found in mixture with the white pine type on slightly warmer sites. Lodgepole pine was a minor type in the Section on upper slopes. Spruce-fir occupied the riparian and moist high basins. The subalpine type was a mixture of whitebark pine, subalpine fir, spruce and lodgepole pine with areas of scattered grass types. Logging activity began on the Idaho portion in the 1860's in association with mining activity. In the early 1880's the construction of the Northern Pacific Railroad and the development of the Butte-Anaconda mining complex had a significant impact on all of the valleys in Montana.

Table 55 - PERCENT ACRES BY COVER TYPE FOR SECTION M333D

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	20.8	8 - SPRUCE-FIR	2.2
3 - DOUGLAS-FIR	2.5	9 - SUBALPINE	8.2
5 - L-DF	19.8	14 - WHEAT-FESCUE	1.7
6 - WHITE PINE	33.8	26 - WATER	0.5
7 - LODGEPOLE PINE	9.2	37 - FES-SNOW	1.3

The age structure of all the types was significantly different form the rest of the CRB for all the types. They all had about twice as many acres of young stands when compared to the averages for the CRB. Except for ponderosa pine, they had about half of the area in overmature type found elsewhere. Ponderosa pine stands still maintained a relatively high amount in the overmature class. This shift in age structure would suggest a more frequent occurrence of stand replacement fire. The young stands probably reflect the impact of the 1889 fire year in this Section.

Table 56 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION M333D

COVER TYPE	NON - STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	8.9	11.1	12.5	9.3	58.2
DF	31.0	21.7	24.0	16.9	6.4
L-DF	27.7	21.1	15.3	12.8	23.1
LP	33.0	38.8	21.3	5.9	1.0
WP	18.8	23.2	19.1	12.1'	26.8
S-F	23.8	4.4	13.4	24.7	33.7

TABLE 57 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	14.5	27.4				14.6	43.6
DF	41.8	25.9	25.9			3.2	3.2
L-DF	38.2		32.2	6.4		17.4	5.8
LP	52.4		40.7	4.9	1.5	0.5	
WP	30.4		36.7	6.1		26.8	
S-F	26.0		15.6	12.3	12.4	33.7	
SUB	'60		5	5	5	5	20

* See Appendix C for descriptions and definitions.

TABLE 57A - PERCENT COVER TYPE BY STRUCTURAL, DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
14	80	20					
37		90		10			

SECTION 341E

Section 341E is located in west central Nevada surrounded by the Clan Alpine Mountains, Shoshone Range, Santa Rosa Range and the Seven Trough Range. Other than stands of pinyon-juniper the vegetation is made up of shrubs and grasses with some areas almost devoid of vegetation. The major vegetation type was desert shrub. It was found at lower elevations in the valleys in mixtures of shadscale, bud sagebrush, winterfat, and greasewood.

The major species on much of this type was shadscale which grows in almost pure stands. In other areas it often shares -dominance with bud sagebrush. Indian ricegrass or galleta may be important sub-dominant species. Winterfat tended to occur in pure stands on well-drained soils mainly in eastern Nevada. Greasewood occured more extensively in the lowermost parts of the valley on poorly drained soils. Great Basin wildrye and saltgrass were found with this community. The sagebrush-grass type was found upslope from the desert shrub type and was made up of a number of sagebrush species. Big sagebrush and black sagebrush were found adjacent to the desert shrub communities while mountain big sagebrush and low sagebrush were found at higher elevations. Bluebunch wheatgrass, needle-and-thread, and galleta are common on most sites with Idaho fescue at higher elevations. The pinyon-juniper type was dominated by singleleaf pinyon and Utah juniper. At the northern end of the Section stands may become pure juniper. Associated species were largely components of the sagebrush-grass cover type that occur adjacent to the woodlands. The tule type is unique in this dry setting and found associated with the numerous small and a few large fresh-water marsh areas. These marsh areas contained bulrush, common cat-tail, narrow-leaved cat-tail and spikerush. Meadows commonly surrounded the marsh with spikerush, baltic rush and saltgrass the principle species. The desert type included areas almost devoid of vegetation or alkali flats. Scattered saltbush may occur.

Table 58 - PERCENT ACRES BY COVER TYPE FOR SECTION 341E

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
13 - SAGE-GRASS	39.8	**47** - DESERT SHRUB	**50.4**
17 - WHEAT-BLUE	T	82 - TULE	**1.5**
27 - PINON-JUNIPER	**4.7**	**85** - DESERT	**3.6**

SECTION 342B

This Section is the largest in the CRB and stretches from central Oregon through northern and western Nevada, northern Utah and southern Idaho. The Section contained 19 cover types but was dominated by shrub vegetation with only some scattered-forest vegetation. Sagebrush-grass was the dominant type particularly in the western portion of the area. Colville describes the central portion of Oregon as "consists primarily of sage brush...Away from stream beds and sinks and the shores of lakes, sage brush covers the whole country like a gray mantle and constitutes probably nine-tenths of the total vegetation" (1896). In the spring there are numerous annuals and tuberous-rooted perennials present. On higher elevations, level or depressed areas have a dense meadow of fine grasses. Major grass species with the sagebrush were bluebunch wheatgrass, Idaho fescue, bluegrass and needle-and-thread. Much of the pinyon-juniper type

was confined to the foothills or mountain ranges that are found in the Section. Western juniper was the major species with none of the pinyon species present. Shrubs commonly found were big sagebrush and low sagebrush. Curl-leaf mountain-mahogany, rabbitbrush, and antelope bitterbrush were found on various edaphic sites. Grasses were primarily bluebunch wheatgrass and Idaho fescue. Sandberg's bluegrass was also common,. The other major vegetation type was the desert shrub community. This cover type was a general type made up of either pure stands or mixtures of shadscale and greasewood. The type is similar to conditions found in Section 341E. The wheatgrass-bluegrass type was found in northern Nevada while the wheatgrass-fescue type occupied central Oregon. This type may be misapplied on portions of these sites and may better be typed as a saltgrass, marsh or tule community. The bristlecone-limber pine type is limited to this Section and unique to Nevada. It is typically an open forest with an understory of bluebunch wheatgrass, sagebrush, and other common associates of the sagebrush-grass type.

Table 59 - PERCENT ACRES BY COVER TYPE FOR SECTION 342B

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	0.2	47 - DESERT SHRUB	7.9
3 - DOUGLAS-FIR	0.4	50 - SHADSCALE	0.8
8 - SPRUCE-FIR	0.3	53 - P-DF-F	0.1
9 - SUBALPINE	T	54 - MT BRUSH	T
12 - RIPARIAN	0.1	56 - GREASEWOOD	0.4
13 - SAGE-GRASS	73.8	74 - ASPEN	0.1
14 - WHEAT-FESCUE	0.3	82 - TULE	0.4
17 - WHEAT-BLUE	1.0	83 - BRIS-LIMP	0.6
26 - WATER	0.8	85 - DESERT	0.7
27 - PINON-JUNIPER	11.9		

The forested types were confined to the low rolling country along the southern boundary of Idaho and on the western boundary in Oregon. On the western portion ponderosa pine was the major type. Most of the type was probably a pine savanna dominated by overmature trees.

Table 60 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342B

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.6	3.0	14.3	14.9	67.2
DF	5.0	14.9	16.6	24.7	38.8
S-F	2.2	6.5	29.1	39.4	22.8'
P-DF-F	0.7	4.6	14.0	12.0	68.7

In Idaho aspen was the primary type with Douglas-fir on the drier slopes and spruce-fir on the higher elevations or in some cases intermixed with the aspen type. On some sites periodic fire was important in preventing conifer encroachment and maintaining the aspen type. In other cases it apparently maintained itself, particularly by sprouting. This type reaches its best development further south and east. Age structure of the types was about average for the CRB.

TABLE 61 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	2.1	30.7				16.8	50.4
DF	12.4	24.3	24.4			19.4	19.5
S-F	5.4		32.4	19.7	19.7	22.8	
P-DF-F	3.0	7.6	14.7	6.0		51.5	17.2
P-J	20	25			10		45

* See Appendix C for descriptions and definitions.

TABLE 61A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	40		60				
17	90	10					
47	5		95				
82	5	95					
85	50		50				

SECTION 342B-1

This is an outlier of the main Section 342B in the southeast corner of Idaho. The area is surrounded on three sides by more mesic conditions which affects the cover types present in this outlier. The wheatgrass-bluegrass was the major type with sagebrush-grass not as dominant as in the main Section. While vegetation types associated with very dry conditions are not mapped in the Section, there could be small inclusions of types found in the main part of Section 342B. Structure and age conditions of the forested types was similar to those found in the main portion of the Section.

Table 62 - PERCENT ACRES BY COVER TYPE FOR SECTION 342B-1

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	0.8	17 - WHEAT-BLUE	49.5
8 - SPRUCE-FIR	4.4	27 - PINON-JUNIPER	0.6
12 - RIPARIAN	1.5	74 - ASPEN	6.4
13 - SAGE-GRASS	36.8		

Table 63 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342B-1

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	5.0	14.9	16.8	24.7	38.8
S-F	2.2	6.5	29.1	39.4	22.8

TABLE 64 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	12.4	24.4	24.4			19.4	19.4
S-F	5.4		32.4	19.7	19.7	22.8	
SUB	10	5	5	20	30	25	5
RIP	5		25		25	40	5
ASP	5		70	25			
P-J	30	25			15		30
B-L	15	35			10		40

* See Appendix C for descriptions and definitions.

TABLE 64A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	50		50				
14	85	15					
17	85	15					
47	5		95				
50	5		95				
54			90		10		
56	10		90				
82	5	95					
85	50		50				

SECTION 342B-2

This is a small outlier of Section 342B in southeastern Oregon. The entire area is typed as desert shrub and represents the dry end of the Section. No forested types were present.

TABLE 65 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
SUB	10	5	5	20	30	25	5
RIP	5		25		25	40	5
ASP	5		70	25			
P-J	30	25			15		30

* See Appendix C for descriptions and definitions.

TABLE 65A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	40		60				
17	85	15					

SECTION 342C

Section 342C is located in southwestern Idaho and eastern Oregon with a minor area in northern Nevada. Vegetation was dominated

by non-forest types with 80 percent covered with sagebrush-grass. Much of the area is in the western portion of the Snake River Plains and has limited relief. Early travelers on the Oregon Trail mention this area as largely brush with scant grass. It is apparent form the early descriptions that sagebrush was a major component in much of the type and grass dominated sites were limited. This description would suggest a relatively stable community with limited impact from fire. Lightening storm track studies suggest this area may have had only limited lightening storm activity and consequently little opportunity for fire starts (Morris 1934, Hironaka et al. 1983). In many cases vegetation was limited and discontinuous and would have made it difficult for a fire to spread without being aided by wind. A number of species of sagebrush are found on the various 'site conditions in the Section. On the warm dry sites black sagebrush was abundant with bluebunch wheatgrass its common associate. Wyoming big sagebrush was widely distributed on the lower Snake River plain and extended to adjacent foothills. It was usually associated with limited rainfall but apparently not as dry as black sagebrush. Bluebunch wheatgrass along with needle-and-thread were major grass species. Big sagebrush occupied the floodplain on deep soils and again bluebunch wheatgrass was a major component. Basin wild rye apparently was also an important associate on these deeper soils. Other sagebrush species represent minor type on edaphic sites. The desert shrub community was found on the driest sites in the Section and were typically very open stands with limited understory species. Shadscale was the dominant shrub along with greasewood on some sites. Winterfat also occupied portions of this area and apparently occurred in almost pure stands. The wheatgrass-bluegrass type was found on the foothills above the sagebrush type and represented a narrow strip between the sagebrush-grass and forested types. Grasses were bluebunch wheatgrass, Idaho fescue and blue grass. Pinyon-juniper was of minor occurrence and found associated with the rougher terrain along the Idaho-Oregon boundary. Juniper was the major component along with mountain mahogany. Patches of sagebrush and bunch grass were found on sites with better soil. The Douglas-fir type was found on the foothills along the northern boundary. Stands were generally open grown with a grass understory.

Table 65 - PERCENT ACRES BY COVER TYPE FOR SECTION 342C

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	0.3	26 - WATER	0.1
12 - RIPARIAN	T	27 - PINON-JUNIPER	2.1
13 - SAGE-GRASS	80.2	47 - DESERT SHRUB	14.4
17 - WHEAT-BLUE	2.8	85 - DESERT	0.1

Stands contained more overmature conditions than average for the

CRB which could be anticipated based on site conditions.

Table 66 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342C

COVER TYPE	NON - STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	5.0	15.0	19.2	25.2	35.6

TABLE 67 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
TYPE	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	12.5	26.0	25.9			17.8	17.8
RIP	5		25		25	40	5
P-J	25	25			10		40

* See Appendix C for descriptions and definitions.

TABLE 67A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT'STAGES

COVER	RANGE STRUCTURAL DEVELOPMENT STAGES*						
TYPE	21	22	23	24	25	26	27
13	30		70				
17	85	15					
47	5		95				

SECTION 342D

The eastern portion of the Snake River Plains makes up the bulk of this Section. The non-forest vegetation types again dominate the landscape with the sagebrush-grass type composing almost 85 percent of the land area. The structure of the type was similar to that found in section 342C. Black sagebrush was present in this Section and represents its northern most distribution in Idaho. It is more common in Utah and Nevada. Although a low precipitation area, much is received during the April-August period resulting in a rich forb population. Grasses included bluebunch wheatgrass, which normally dominates the understory plus Sandberg's bluegrass, needle-and-thread and Indian ricegrass. The type was associated with limestone derived soils in limited moisture zones. Big Wyoming sagebrush is found on the lower Snake River Plain and adjacent foothills. Bluebunch wheatgrass was the major grass species with Sandberg's bluegrass and squirrel-tail. Microsites contained Thurber's needlegrass and needle-and-thread. Big sagebrush was found mainly in floodplains on deep soils along with bluebunch wheatgrass or

Idaho fescue on moister sites. Mountain big sagebrush was found on the cooler and more mesic sites along the foothills on the north side of the Section. Bluebunch wheatgrass was common on the drier portions with Idaho fescue on moister sites. Needle-and-thread was often present on warm and dry sites. Minor areas of three-tipped sagebrush were found between the Wyoming big sagebrush and mountain big sagebrush and was important because of its ability to resprout following fire. Other species may be present but in minor amounts. The grass type was represented by the wheatgrass-bluegrass type. It was found along the eastern boundary on the foothills between the sagebrush types and the forested types. Idaho fescue was present along with valley sagebrush. Mountain brush and scattered clusters of aspen were also present. The desert shrub and desert types typically were associated with low precipitation and heavy soils with the desert type almost devoid of vegetation. Shadscale was the major species in both types along with greasewood. The forested types were incidental inclusions primarily along the southeast portion of the Section.

Table 68 - PERCENT ACRES BY COVER TYPE FOR SECTION 342D

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
3 - DOUGLAS-FIR	0.5	27 - PINON-JUNIPER	0.2
7 - LODGEPOLE PINE	0.4	47 - DESERT SHRUB	1.2
8 - SPRUCE-FIR	0.2	74 - ASPEN	0 . 4
13 - SAGE-GRASS	84.4	85 - DESERT	9.1
17 - WHEAT-BLUE	3.6		

Table 69 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342D

COVER TYPE	NON-STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
DF	16.4	23.8	8.2	14.6	37.0
LP	0.4	27.7	30.1	15.2	26.6
S-F	2.2	6.5	29.1	39.4	22.8

The overmature component for Douglas-fir and lodgepole pine was slightly higher than the average for the CRB, and the Douglas-fir type shows a significantly greater amount of young stands while the spruce-fir type had a limited amount of overmature.

TABLE 70 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST INI	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
DF	28.3	17.4	17.3			18.5	18.5
LP	14.2		44.0	24.7	3.8	13.3	
S-F	5.4		32.4	19.7	19.7	22.8	
P-J	35	30			15		20
ASP	5		70	25			

* See Appendix C for descriptions and definitions.

TABLE 70A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	30		70				
17	85	15					
47	5		95				
85	50		50				

SECTION 342H

Section 342H is located in central Oregon between the Blue Mountain complex and the east side slopes of the Cascade Range. True forested types covered only about five percent of the Section with sagebrush-grass the major cover type. Big sagebrush was the most common variety of sagebrush and bluebunch wheatgrass was the common grass. Sandberg's bluegrass was also a common associate. Idaho fescue become important on moister environments. On shallow, stony soils (scab flats) low sagebrush was common. This species gives way to scab sagebrush on very shallow, stony soils. Sandberg's bluegrass becomes the dominant grass on these sites. The pinyon-juniper type represents one of the largest examples of juniper forest in the world and lies in the transition between the sagebrush-grass type to the south and the bunchgrass type of the Columbia River. Pinyon pine was not represented in this type with western juniper the major species. Understories were made up of big sagebrush with bitterbrush common on some sites. Bluebunch wheatgrass, Idaho fescue were the major grasses with Sandberg's bluegrass and Thurber's needlegrass common. The extent and density of the pinyon-juniper type has been debated about as much as the extent of the sagebrush-grass community. While age information is not available from Forest Survey data the literature suggests a relatively low amount of older aged trees with the young aged stands well represented suggesting an expanding population (USDA,

Forest Service 1977). A significant portion of the Section is typed as a wheatgrass-fescue type confined to the northern portion. This type appears to be an extension of the grass type of the Columbia River area. It apparently evolved with little pressure from grazing or fire.. It appears however to be insensitive to fire and was a relatively stable community. The type represented a slightly moister environment than the sagebrush dominated stands. Portions of the type may be wheatgrass-bluegrass but data was not available to determine its extent. The wheatgrass-bluegrass type apparently was slightly drier and Idaho fescue may be limited. The ponderosa pine type represents inclusions on the edge of the Section. About five percent of the type may have fit the savanna designation and 88 percent of the type was shown as a pure type. Minor amounts of lodgepole pine in depressions or wet areas were found in association with the pine type.

Table 71 - PERCENT ACRES BY COVER TYPE FOR SECTION 342H

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	5.1	14 - WHEAT-FESCUE	17.6
7 - LODGEPOLE PINE	0.1	27 - PINON-JUNIPER	31.2
13 - SAGE-GRASS	46.0		

The ponderosa pine type had about a third of the normal percent of young stands found in the CRB and slightly more overmature type. This structure would be typical of an open relatively level stand with a grass understory. The lodgepole pine type also had significantly less young growth which may relate to its location in moist depressions.

Table 72 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342H

COVER TYPE	NON-STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.5	2.1	13.6	15.6	68.2
LP	1.1	4.4	37.6	44.7	12.2

TABLE 73 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	1.6	30.2				17.0	51.2
LP	3.3		39.8	39.6	11.2	6.1	
P-J	25	25			10		40

* See Appendix C for descriptions and definitions.

TABLE 73A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	6 0		40				
14	85	'15					

SECTION 342H-1

This is a small outlier of 342H which is found to the southwest of the major unit. While the mix of types is slightly different the structure of each is the same as indicated in 342H.

Table 74 - PERCENT ACRES BY COVER TYPE FOR SECTION 342H-1

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	24.5	27 - PINON-JUNIPER	5.3
13 - SAGE-GRASS	70.2		

Age structure is also the same as in 342H.

Table 75 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 342H-1

COVER TYPE	NON - STOCKED	SEED-SAP 1-40	POLES 41-100	MATURE 101-150	OVER MATTJRE 151+
PP	0.6	2.2	13.6	15.7	67.9

TABLE 76 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	1.7	30.4				17.0	50.9
P-J	25	25			10		40

* See Appendix C for descriptions and definitions.

TABLE 76A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	60		40				

SECTION 3421

This Section covers the interior of central Washington and northcentral Oregon. The area is about 97 percent non-forest with the sagebrush-grass type the major cover. The primary cover was composed of big sagebrush with bluebunch wheatgrass and represented the best development of the type. Moister environments had Idaho fescue as a major component and they were identified as a sagebrush-fescue type. In other Sections this type is not differentiated but included as part of the sagebrush-grass association. The other major sagebrush type was three-tipped sagebrush-fescue which is found on apparently moister environments than big sagebrush. Idaho fescue was the major grass component. This type was also included with the general sagebrush-grass type in other Sections. A minor type, bitterbrush-fescue, was found typically on deep sandy soils. Bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass and balsam root were herbaceous layer dominants. This type was limited in other areas and portions may be included in the general sagebrush-grass type. The fescue-snowberry type was one of the moistest types composed of patches of snowberry in a grass community of Idaho fescue, bluebunch wheatgrass, june grass, and bluegrass. This type appears stable and fire apparently had no impact on the shrub coverage. Ponderosa pine was the major forested type and found along the northeast and southwest boundaries. About 10 percent of the type was considered pine savanna but was not mapped separately because of map scale. Data suggests that about 68 percent of the type was considered pure ponderosa pine. The ponderosa pine type had significantly less percentage of the young age class and more overmature class reflecting the open dry environment over much of the area.

Table 77 - PERCENT ACRES BY COVER TYPE FOR SECTION 3421

COVER TYPE	PERCENT COVER	COVER TYPE	PERCENT COVER
2 - PONDEROSA PINE	2.9	36 - SAGE-FESCUE	3.5
13 - SAGE-GRASS	55.7	37 - FES-SNOW	0.5
14 - WHEAT-FESCUE	21.7	39 - 3 TIPPED-FES	12.9
17 - WHEAT-BLUE	1.6	41 - BITT-FESCUE	0.8
27 - PINON-JUNIPER	0.3	44 - OAK-MADRONE	0.1

Table 78 - AGE STRUCTURE IN 1900 FOR MAJOR FOREST COVER TYPES IN SECTION 3421

COVER TYPE	NON-STOCKED	SEED-SAP l-40	POLES 41-100	MATURE 101-150	OVER MATURE 151+
PP	0.6	2.2	10.8	7.9	78.5

TABLE 79 - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	FOREST STAND STRUCTURAL DEVELOPMENT STAGES*						
	ST IN1	ST. EXO	ST EXC	UN REI	YF-MST	OF-MST	OF-SS
PP	1.7	19.8				19.6	58.9
P-J	35	30			15		20
O-MAD	10	15	10				65

* See Appendix C for descriptions and definitions.

TABLE 79A - PERCENT COVER TYPE BY STRUCTURAL DEVELOPMENT STAGES

COVER TYPE	RANGE STRUCTURAL DEVELOPMENT STAGES*						
	21	22	23	24	25	26	27
13	60		40				
14	80	20					
17	80	20					
36	40	20	40				
37		90		10			
39		50		50			
41	60		40				

APPENDIX A - LEGEND FOR COLUMBIA RIVER BASIN HISTORIC VEGETATION MAP

TYPE NO.

1 Ponderosa pine savanna - Fringe type ponderosa pine (Pinus ponderosa) forests forming very thin stands of quasi-commercial character, intermingled with prairie. (footnote in Highlights of the forest situation in Fergus County Number 19) This type was not defined in the original definitions of cover types for Montana, Idaho and northeastern Washington (14). Based on stocking definitions these stands probably contained less than three thousand board feet per acre (3,17).

An area with solitary trees, or groups of trees too small to map separately, in which mature ponderosa pine is the predominating tree. A borderline zone, characteristic of the fringes of the desert and of the breaks between timbered plateaus and treeless canyons, where the area of grass or sagebrush may be as great or greater than the area of timber. This type usually merges at its upper boundary with timberland types and at its lower limit with open land. For the zone as a whole the volume per acre is ordinarily less than three. thousand board feet. The trees are not necessarily noncommercial **(15)**.

Characteristically open stands, chiefly of ponderosa pine type that average less than two thousand board feet per acre, are less than 10 percent stocked with pole trees and less than 40 percent stocked with seedling-sapling trees. They are fringe forests between prairie and dense forest (3).

2 Ponderosa pine - Stands containing at least three thousand board feet per acre in trees 12 inches d.b.h. and over, of which 25 percent or more by volume is ponderosa pine (3,17).

Forests containing approximately 50 percent or more, by volume, of ponderosa pine, sugar pine (Pinus lambertiana), or Jeffrey pine (P. jeffreyi), or any combination of these species, except those in which sugar pine is the key tree, in which the stands are continuous in contrast to the more open ponderosa pine wlldland type (15).

In California areas with 80 percent ponderosa, Jeffery or sugar pine (9).

3 Douglas-fir - Contain at least four thousand board feet per acre in trees 14 inches d.b.h. and over, of which 60 percent or more by volume is Douglas-fir (Pseudotsuga menziesii) (3,15,17,).

In California, types with 80 percent Douglas-fir or mixtures of Douglas-fir and the true firs in which Douglas-fir comprises 20 percent or more of the commercial conifer cover (9).

4 Douglas-fir savanna - Fringe type Douglas-fir forests forming very thin stands of quasi-commercial character, intermingled with prairie (footnote in Highlights of the forest situation in Fergus County Number 19). This type was not defined in the original definitions (Forest Survey Release 3) (17). Based on stocking definitions these stands probably contained less than three thousand board feet per acre (16).

5 Larch-Douglas-fir - Stands containing at least four thousand board feet per acre in trees 14 inches d.b.h. and over, of which 75 percent or more by volume is larch-fir (3,17).

In Oregon and Washington the upper-slope mixture is included which is defined as mixed forests ordinarily above the ponderosa pine zone, never containing more than a negligible quantity of that species. Characteristic of the colder, moister sites. Contains variable proportions of larch (Larix occidentalis), white fir (Abies concolor), alpine fir (A.lasiocarpa), Douglas-fir, Engelmann spruce (Picea engelmannii), lodgepole pine (Pinus contorta), white pine (P. monticola) and occasionally other species (15).

6 White pine - Stands contain at least four thousand board feet per acre in trees 12 inches d.b.h. and over, of which 15 percent or more by volume is white pine (3,17).

In Oregon and Washington portions of the pine mixture and upper-slope mixture types may meet the above definition but were not identified separately (15).

7 Lodgepole pine - Stands contain at least three thousand board feet per acre in trees 12 inches d.b.h. or over, of which 50 percent or more by volume is lodgepole pine (3,17,15).

In California stands in which lodgepole pine comprises 80 percent or more of the commercial conifer cover (9).

8 Spruce-fir - Stands which contain 50 percent or more Engelmann spruce by volume with less than 15 percent white pine (3,15,17). This type is not recognized in Oregon and Washington. Portions of the upper-slope mixture type may meet the definition but are not identified (15).

In Californi.a a fir type is recognized and defined as areas with true firs comprising more than 80 percent or more of, the commercial conifer cover (9).

9 Subalpine - This type includes all forest growth above the altitude limit of merchantability plus areas typed as rocky-noncommercial which are defined as too rocky, too steep, or too sterile to produce a stand of commercial size, density, and quality. The timber may consist of any species, but is not and is not likely to be of commercial value because of low quality, poor form and low volume (3,17).

Forests at upper limits of tree growth, usually unmerchantable because of poor form and small size. Principal components are alpine fir, mountain hemlock (Tsuga mertensiana), Shasta red fir (Abies magnifica var. shastensis), lodgepole pine, whitebark pine (Pinus albicaulis), western white pine, and alpine larch (Larix lyalli). Usually interspersed with meadows and glades. The noncommercial type is defined the same as above (15).

Forest land incapable of yielding usable wood products (usually saw timber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future. Includes a minor amount of productive land withdrawn through statue, ordinance, or administrative order (9).

10 Alpine - **No** definition is provided by the Forest Survey or Morris (3,7,9,15,17). Kuchler describes it as short grasses and sedges, dense to very open with extensive barren areas and many forbs. Dominant species are: bentgrass (Agrostis), sedges (Carex), fescue (Festuca) and bluegrass (Poa) (5).

12 Hardwood riparian - Stands where cottonwood (Populus trichocarpa) predominates (3,17).

Forests in which maple (Acer), aspen (Populus tremuloides), cottonwood, etc. predominate; pure or in mixture (15).

13 Sagebrush-grass - Mapped by Morris for Montana but undefined (7). Kuchler describes it as a sagebrush steppe of dense to open grassland with dense to open shrubs. Dominants are bluebunch wheatgrass (Agropyron spicatum) and big sagebrush (Artemisia tridentata) (5). It is a widespread type found throughout the Pacific northwest and eastward to the Rocky Mountains.

14 Wheatgrass-fescue - Mapped by Morris for Montana but undefined (7). Kuchler describes it as dense, low to

medium tall grassland found in eastern Washington and northwestern Idaho. Dominants are bluebunch wheatgrass and Idaho fescue (Festuca idohensis) (5).

15 Wheatgrass-needle & thread-grama - Morris mapped the type for Montana but does not define it (7). Kuchler describes a type described as grama-needlegrass-wheatgrass for Montana and Wyoming. It is characterized as rather short, open to fairly dense grass dominated by western wheatgrass, (Agropyron smithii), blue grama (Bouteloua gracilis) and needle-&-thread (Stipa comata) (5).

16 Wheatgrass-needle & thread-green needlegrass - This is a type shown by Morris on his map but not described (7). Kuchler describes a similar type called wheatgrass-needlegrass which is a moderately dense, short or medium tall grassland occurring in western North and South Dakota, eastern Montana, Wyoming and Colorado. Dominants are western wheatgrass, blue grama needle-and-thread grass and green needlegrass (Stipa viridula) (5).

17 Wheatgrass-bluegrass - A dense, low to medium tall grassland found in Washington, Oregon and northwestern Idaho. Dominates are bluebunch wheatgrass, Idaho fescue and Sandberg's bluegrass (Poa secunda) (5).

20 Needle & thread-wheatgrass-grama - This type is mapped by Morris for Montana but is not described (7). Kuchler does not list a similar type, however, it is apparently very similar to type 15 with needle & thread the dominant grass.

2 6 Water - Major bodies of water principally lakes.

27 Pinon-Juniper - Stands composed principally of juniper (Juniperus), often with more or less mountain mahogany (Cercocarpus ledifolius) . Land where the trees are so scattered that they occupy less than about 5 percent of the ground surface is not classified as juniper woodland. Generally pinyon pine is not present (15).

Open groves of needleleaf evergreen low trees with varying admixtures of shrubs and herbaceous plants. Dominants are oneseed juniper (Juniperus monosperma), Utah juniper (Juniperus osteosperma), Pinon pine (Pinus edulis) and oneleaf pine (Pinus monophylla) (5).

32 Barren - An area too rocky, too scanty as to soil, or too exposed, to support a vegetative cover of either trees, shrubs or herbs (3,17). In Oregon and Washington it also includes cities, towns, and unmeandered water surface (15).

36 Sagebrush-fescue - The major difference between this type and type 35 is the presence of Idaho fescue as a major grass species. Sites are typically moister and grasses provide a higher coverage (6).

37 Fescue-snowberry - This type represents the moistest of the steppe zones and is referred to as meadow steppe. The herbaceous component is dominated by Idaho fescue, bluebunch wheatgrass, Junegrass (Koeleria cristata) and Poa (Poa ampla) along with a great variety of forbs. The shrub layer is composed of dwarfed; inconspicuous sterile shrubs scattered through the herbland including snowberry (Symphoricarpos alba) and rose (Rosa nutkana or woodsii) (6).

38 Fescue-rose - This type is very similar to 37 however snowberry is absent. It is found in the rain shadow of the Blue Mountains (6).

39 Threetipped sage-fescue - This type is considered part of the meadow-steppe associations. A dense sward of grasses including Idaho fescue, bluebunch wheatgrass, bluegrass and three-leaved sedge (Carex filifolia) are common along with a variety of forbs and a discontinuous layer of sage. Shrubs found on types 37 and 38 are missing (6).

41 Bitter-brush-fescue - The type appears like a shrub steppe however it has an abundance of broad-leaved forbs. Bitter-brush is the only tall shrub along with a dense layer of bluebunch wheatgrass, Idaho fescue, bluegrass and balsam root (Balsamorhiza sagittata) (6).

43 Chaparral - Areas supporting heavily branched dwarf trees or shrubs, usually evergreen, the crown canopy of which covers more than 50 percent of the ground and whose primary value is watershed protection. The most common chaparral constituents are species of manzanitas (Arctostaphylos), scrub oaks (Quercus), mountain mahogany, bear-brush (Garrya), ceanothus (Ceanothus), and chamise (Adenostoma) (9).

Snowbrush (Ceanothus velutinus) and greenleaf manzanita (Arctostaphylos patula) are key species in the main formation with curl-leaf mountain-mahogany dominant along the arid borders (11).

44 Woodland-grass - Areas with hardwood trees (oaks, madrone (Arbutus menziesii), etc.) and herbaceous vegetation occurring in mixture--without commercial conifers--and the trees covering from 5 to 80 percent of the ground area and predominant over minor conifers present in the cover (9).

47 Desert shrub - This general type is a mixture of shadscale (Atriplex confertifolia), salt sage (Atriplex nuttallii), or saltbush-greasewood (Atriplex-Sarcobatus) communities found on saline sites. Grasses are wild-rye (Elymus cinereus), beardless wild-rye (E. triticoides) and desert saltgrass (Distichlis stricta) (6).

50 Shadscale - Shadscale is the most abundant species of vegetation and grows mainly on a shallow, heavy soil with more or less alkali in the subsoil. Areas are too dry for sagebrush (12).

53 Pine-DF-fir - Areas with mixtures of the commercial pines and/or Douglas-fir, incense cedar (Libocedrus decurrens) and the true firs in which no one species comprises as much as 80 percent of the commercial conifer cover. This mixed type subdivides between the Douglas-fir, ponderosa pine, white pine, and fir-spruce Forest Survey types (9).

54 Mountain Brush - The most important plants are snowberry, oak, serviceberry (Amelanchier), mountain mahogany and chokecherry (Prunus) (8).

Mountain slopes supporting a variety of brush species commonly called mountain brush, consisting of such species as oak brush, service berry, buck brush (Ceanothus) bitter-brush, mountain mahogany, and chokecherry. The type usually has an undergrowth of grasses and weeds (1).

56 Greasewood - Sites where poor drainage has resulted in an accumulation of alkali and a vegetative growth limited to alkali-resisting plants (12). Associated with greasewood are saltbush and some of the alkali-tolerant grasses - dropseed (Sporobolus), cordgrass (Spartina) and saltgrass (8).

A greasewood type denotes a more or less alkaline soil. On less alkaline sites greasewood is found in mixture with shallow-rooted grasses and forbs. Tall rabbit brush (Chrysothamnus nauseosus var. speciosus), shadscale, muhly (muhlenbergia), dropseed grass, grama grass (Bouteloua) and triple awn (Aristida) are common. On sites with a high water table salt grass and alkali sacaton (Sporobolus airoides) are common. In black alkali areas the land is substantially barren (1).

61 Lodgepole pine-spruce-subalpine fir - A type defined for the Yellowstone Park. Percentage of species was not indicated **(21)**.

64 Douglas-fir-lodgepole pine-spruce - A composite of

types for Yellowstone Park including areas typed as Douglas-fir; Lodgepole pine; spruce-subalpine fir; lodgepole pine-spruce-subalpine fir and lodgepole pine-Douglas-fir-subalpine fir. Percentages of various species was not indicated (21).

69 Willow - This type was defined for the Yellowstone Park and probably represented wet meadows with willow shrubs (Salix) (21).

74 Aspen-grass - A type defined for Yellowstone Park. No species percentages were indicated. The type was probably characterized by grasses associated with meadow environments (21).

a2 Tule marshes - Composed of tall graminoid vegetation dominated by common tule (Scirpus acutus), California bulrush (Scirpus californicus), olney bulrush (Scirpus olneyi), tule (S. validus), cattail (Thpha domingensis) and soft flag (T. latifolia) (5).

Areas of very poorly drained or partially submerged soils supporting herbaceous vegetation of such species as samphire (Salicornia ambigua) and cattail (T. latifolia) (11).

a3 Great Basin pine forest - Consists of open forest of low to medium tall needlefeaf evergreen trees with shrubs and grass especially in the lower elevations. Dominants are bristlecone pine and limber pine (5).

a5 Desert - Vegetation largely absent (5). Areas typed as desert in Utah by Kuchler were typed as 56, Greasewood, by others **(12)**.

86 Plains grass - Composed of species such as grama grass, western wheat grass (Agropyron smithii), triple awn, June grass and three-leaved sedge along with bluebunch wheatgrass, rice grass (Oryzopsis), muhly, and blue grasses. Scattered shrubs such as sagebrush, buck brush, bitter-brush, service berry, wild rose, wild currants (Ribes), buckthorn (Rhamnus), cinquefoil (Potentilla), and elderberry (Sambucus) (1).

Kuchler describes this type as open grasslands, sometimes fairly dense, with scattered dwarf shrubs. Dominants are western wheatgrass, big sagebrush, plains bluegrass (Poa arida) and needle-and-thread grass (Stipa comata) (5).

Forest types described but generally occur in patches too small to be mapped at the landscape level.

90 White fir - Forests containing 50 percent or more, by volume, of Abies grandis or A. concolor. Usually occur within the range of ponderosa pine (15).

91 Fir-hemlock - Forests in which either noble fir (Abies procera), silver fir (A. amabilis), alpine fir, Shasta red fir, white fir, mountain hemlock (or occasionally, western hemlock), or any combination of these species composes at least 50 percent of the volume of the stand, This type is characteristic of the upper slopes of the Cascade Range (15).

In Montana and Idaho the type is called western hemlock-white fir and defined as stands containing 50 percent or more, by volume, of western hemlock and white fir, separately or combined, .or which contains sufficient hemlock and white fir trees to make 50 percent or more by volume at maturity. A mixture of 15 percent by volume of white pine would throw the classification to the white pine type. Twenty-five percent by volume of ponderosa pine would class it as ponderosa pine type (14).

92 Western red cedar - Forests containing approximately 40 percent or more, by volume, of western red cedar (Thuja plicata). Largely confined to swamps and stream margins on the eastern Washington national forests (15).

A stand in which western red cedarpredominates by volume, with less than 15 percent by volume of white pine or 50 percent by volume of hemlock in the mixture. Common associates are western hemlock, lowland white fir, western white pine and occasionally, Douglas fir and larch (14).

93 Sitka spruce - A forest containing 50 percent or more by volume of sitka spruce (Picea sitchensis), rarely in pure stands, usually in mixture with Douglas fir, western hemlock, or western red cedar (13).

94 Western hemlock - A forest in which 50 percent or more of the volume is western hemlock with a variable amount of Douglas fir, western red cedar, silver fir, and Sitka spruce (13).

96 Western red cedar-white fir - A stand composed of cedar and lowland white fir - the former nearly pure in patches, the latter predominant for the stand as a whole, with a considerable amount of Douglas fir, some ponderosa pine in groups on the knolls and as scattered individuals and rarely single white pines (14).

SUMMARY OF VEGETATION TYPES

TYPE NAME	TYPE NUMBER
PONDEROSA PINE SAVANNA	1
PONDEROSA PINE	2
DOUGLAS-FIR	3
DOUGLAS-FIR SAVANNA	4
LARCH-DOUGLAS-FIR	5
WESTERN WHITE PINE	6
LODGEPOLE PINE	7
SPRUCE-FIR	a
SUBALPINE	9
ALPINE	10
RIPARIAN	12
SAGEBRUSH-GRASS	13
WHEATGRASS-FESCUE	14
WHEAT-N&T-GRAMA	15
WHEAT-N&T-GREEN NEEDLE	16
WHEATGRASS-BLUEGRASS	17
N&T-WHEAT-GRAMA	20
WATER	26
PINYON-JUNIPER	27
BARREN	32
SAGEBRUSH-FESCUE	36
FESCUE-SNOWBERRY	37
FESCUE-ROSE	38
THREETIP SAGE-FESCUE	39
BITTERBRUSH-FESCUE	41
CHAPARRAL	43
OAK-MADRONE	44
DESERT SHRUB	47
SHADSCALE	50
PINE-DF-FIR	53
MOUNTAIN BRUSH	54
GREASEWOOD	56
LP-S-AF	6 1
DF-LP-S	64
WILLOW	69
ASPEN-GRASS	74
TULE MARSHES	a2
BRISTLECONE P-LIMBER P	a3
DESERT	a5
PLAINSGRASS	86
WHITE FIR	90
FIR-MT HEMLOCK	91
WESTERN RED CEDAR	92
SITKA SPRUCE	93
WESTERN HEMLOCK	94
W RED CEDAR-WHITE FIR	96

REFERENCES FOR HISTORIC VEGETATION MAP LEGEND

1. Aldous, Alfred E. 1929. Land classification of the northern Great Plains: Montana, North Dakota, South Dakota and Wyoming. USDI, Geological Survey, Washington DC.

2. Burks, George F. & Adon Poli. December, 1950. Area and ownership of forest land in Siskiyou County, California. Forest Survey Release No. 8. Forest Survey Statistical Service, USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca.

3. Kemp, Paul D. & H.J. Pissot. 1949. Forest Resources of Northeast Washington. USDA, Forest Service, Station Paper Number 21, Northern Rocky Forest and Range Experiment Station, Missoula, Mt. 30p. map.

4. Kemp, Paul D. & M.B. Dickerman. October 1950. Montana Forest Resource & Industry Statistics. USDA, Forest Service, Station Paper Number 25, Northern Rocky Forest and Range Experiment Station, Missoula, Mt. 49p. map.

5. Kuchler, A.W. 1964. Potential natural vegetations of the conterminous United States. Am. Geophs. Soc., N.Y., Spec. Publ. 36. 116p. Revised in 1965 and 1966.

6. Franklin, Jerry F. and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. USDA, Forest Service General Technical Report, PNW-8, Washington.

7. Morris, M.S. 1964. Natural vegetation of Montana. School of Forestry, Montana State University, Missoula, Mt. 1 map.

a. Stoddart L.A. 1940. Range resources in Rich County, Utah. Utah Agriculture Station Bulletin 291. Utah Agricultural Experiment Station, Utah State Agricultural College, Logan, Utah. 30p. map.

9. Wieslander, A.E., Herbert A. Jensen. March 1946. Forest areas, timber volumes and vegetation types in California. Forest Survey Release No. 4. Forest Survey Statistical Service, USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca.

10. Wilson, Alvin K. 1962. Timber resources of Idaho. Forest Survey Release Number 3, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, Ut. 42p map.

11. Wilson R.C. August 1941. Vegetation types and forest conditions of Douglas, Ormsby and southwestern Washoe Counties Nevada. Forest Survey Release No. 2. Forest Survey Statistical Service, USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca.

12. Woolley, Ralf R. 1946. Cloudburst floods in Utah, 1850-1938. Geological Survey Water-supply Paper 994. USDI, Geological Survey, Washington DC. 128p. map (compiled by Conservation Branch, 1931).

13. U.S.Department of Agriculture, Forest Service. March 1934. Forest statistics for western Washington Counties from inventory phase of Forest Survey. Forest Survey Statistical Service, USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or. 104p.

14. U.S.Department of Agriculture, Forest Service. Revised April 1935. Instructions for the inventory phase of the Forest Survey of the Inland Empire Region for,lands other than National Forest. Forest Survey Statistical Service, USDA,. Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 104p.

15. U.S.Department of Agriculture, Forest Service. February 1936. The Forest Survey of eastern Oregon and eastern Washington. Forest Survey Statistical Service, USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or'. 8p.

16. U.S.Department of Agriculture, Forest Service. March 1937. Forest statistics Pend Oreille County, Washington.'Forest Survey Release No. 2. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 24p.

17, U.S.Department of Agriculture, Forest Service. April 1937. The inventory phase of the Forest Survey Northern Rocky Mountain Region: Definition of the procedure, terms, and classifications. Forest Survey Release No. 3. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

18. U.S.Department of Agriculture, Forest Service. April 1941. Northern Idaho's Forest Problem 1941. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 24p. map.

19. U.S.Department of Agriculture, Forest Service. September 1943. Highlights of the forest situation in Fergus County, Number 16. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

20. U.S. Department of Interior, Geological Survey. 1931. Land classification of the central Great Plains Part l-5. USDI, Geological Survey, Washington DC.

21. U.S. Department of Interior, National Park Service. 1945. Vegetation type map, part of the master plan for Yellowstone National Park. USDI, National Park Service, Branch of Forestry,

Washington DC. 2 maps.

APPENDIX B - PROCESS TO BACKDATE 1930's FOREST SURVEY AND OTHER TIMBER INVENTORY DATA TO 1900

FOREST SURVEY

Western Montana, northern Idaho and northeast Washington

Field data for this inventory was collected between 1932 and 1937. The survey included all land ownerships and was developed for each county. Maps prepared by the survey were used to portray the coverage of the various vegetation types in each state. Adjustments to the age structure however were required to properly reflect natural stand conditions. These adjustments were necessary to correct for timber harvest, burns which occurred since 1900 and natural aging of the stands. By the 1930's appreciable portions of the private land had been harvested. In most cases, however, Forest Service lands were largely undeveloped and for that reason only Forest Service lands was used to evaluate age structure. This data was then expanded for the entire cover type on all ownerships. In Montana and northeastern Washington cutover Forest Service lands were not identified and were included in this process. As a result the mature and overmature age classes particularly for the ponderosa pine type may be underestimated. All cover types in Deerlodge and Silverbow Counties, Montana may also be affected as a result of early timber harvest to support the mining activity in the Butte-Anaconda area. In Idaho data was split between cut and uncut lands and harvested lands could be excluded in the age adjustment process. The inventory data provided a breakdown of acres of the various cover types by 20-year age increments. To adjust for harvested acres, cutover lands were considered mature or overmature in 1900. Areas shown as burned were distributed to the various age classes based on the percentage of the cover type in the class. This procedure was followed to better represent the natural fire process in which fires burned in all age classes and not just mature stands (Ayres 1899). The time interval from 1900 to the date of the inventory was calculated and subtracted from each age class and a new age distribution developed. All acres were assumed to remain in the same cover type. This information is presented in the age structure tables in the report.

Eastern Oregon and Washington

Age information was not as complete in surveys conducted in these two states and therefore age structure is more subjective. Information on cutting activity was available for all lands and adjustments were made as described above. A portion of the burned over areas was also indicated by cover type. The remaining cutover lands and some burned acres were not assigned to a specific cover type and these were apportioned by the percentage of each cover type. Counties in the western portion of the states contained age information by lo-year age classes

for major timber types and they were adjusted as above. For less important species such as lodgepole pine and counties in the eastern portion of the states information was provided by general age classes only. For these conditions the descriptive information in the type definitions was consulted to determine a general age range for the class. It was then assumed that trees were equally distributed in lo-year increments for all portions of the class. By subtracting the difference from the survey date 'and 1900 from these increments new age classes were developed.

OTHER SURVEYS

Data included information from 1905 to 1959 and was highly variable in respect to its presentation. In most cases it was presented in lo-year, 20-year or 40-year age classes, however a few surveys provided only general age classes. These surveys were avoided except where other more complete surveys were limited. In some cases the young age class was defined as 0 to 40 years of age. In these cases 25 percent of the class was assumed to be nonstocked. Information about timber harvest was commonly not included thereby potentially increasing the percent of the young aged class. After accounting for the characteristics of the individual survey backdating procedures were the same as described above.

SECTION AGE STRUCTURE

The age structure presented for each Section represented a composite of the age structure developed for each county or area. Information was developed from the various GIS layers which indicated the area of each cover type by Section and county. This data provided a method to weight the age classes for each county to develop the composite information presented in the report.

APPENDIX C - FOREST STAND STRUCTURAL DEVELOPMENT STAGES

Structural Stage	Definition and Description
Stand Initiation (ST INI)	Reoccupancy of growing space following stand replacement disturbance: 1 canopy stratum; 1 cohort; seedlings, grass, forbs, shrubs present.
Stem Exclusion - Open Canopy (ST EXO)	New tree stems excluded, crowns open, canopy broken: 1 broken canopy stratum of trees.' Trees excluding new stems through underground competition. Saplings, poles, small or medium trees.
Stem Exclusion - Closed Canopy (ST EXC)	New tree stems excluded, crowns/canopy closed: Continuous canopy; $\geq$ 1 canopy strata; 1 cohort. Lower strata (if present) is same age as upper strata. Saplings, poles, small or medium trees. Understory vegetation may be absent or present.
Understory Reinitiation (UN REI)	Establishment of second cohort beneath older overstory: Broken canopy; $\geq$ 2 canopy strata; 2 cohorts. Overstory decline creates growing space for new trees. Overstory is poles, small, medium, or large trees.
Young Forest - Multi-Strata (YF-MST)	Multicohort stand with no old trees, may be managed. Multi-strata stand characterized by diverse horizontal and vertical distributions of trees and tree sizes. Old trees generally absent.
Old Forest - Multi-Strata (OF-MST)	Multicohort, multi-strata stand with old trees. Multi-strata stand characterized by diverse horizontal and vertical distributions of trees. Some trees old. All tree sizes may be present.
Old Forest - Single-Strata (OF-SS)	Single-strata stand of old trees. None or few young trees. Broken or continuous canopy of large, old trees. Trees may be single-cohort or multicohort, maintained by fire. Overstory is medium or large trees. Understory absent or seedlings or saplings.

STRUCTURAL STAGES FOR NON-FORESTED VEGETATION

NUMBER	TITLE'
21	Open* herbland
22	Closed herbland
23	Open low-medium shrub
24	Closed low-medium shrub
25	Open tall shrub
26	Closed tall shrub, single stratum
27	Closed tall shrub, multi-strata

* Open - A canopy with less than 67 percent project crown cover
Closed - A canopy of at least 67 percent projected crown cover
Low shrubs - Shrubs that typically do not exceed 20 inches (50 cm) in height
Medium shrubs - Shrubs typically > 20 inches (50 cm) tall and c 6.5 feet (2m) tall
Tall shrubs - Shrubs typically > 6.5 feet (2m) tall but < 16.5 feet (5m) tall

APPENDIX D. MAP AND DATA SOURCES FOR LANDSCAPE SECTIONS IN THE COLUMBIA RIVER BASIN

HISTORICAL VEGETATION MAP SOURCES

Montana

Map information for the forested types in Montana came from Hutchinson'& Kemp (1952) which includes a generalized map of forest types for the state. This map was developed from the county information developed for the state in the 1930's Forest Survey. Non-forest vegetation was generally based on Morris (1964). Other sources consulted were Ross & Hunter (1976), Payne (1973) and Kuchler (1964).

Idaho

Map information for the forested types in Idaho came from Wilson (1962) and Hutchinson and Winters (1942). Information from Hutchinson and Winters was based on the 1930's Forest Survey and included the portion of the state north of the Salmon River. Wilson's map refined the northern portion of the state using information from the resurvey made between 1947 and 1951. He also added forest types for the remainder of the state based on information from the Forest Survey conducted between 1950 and 1954. Non-forest vegetation for southern Idaho was based on Hoyt (1935) with modifications from Shantz and Zon (1923) and Kuchler (1964) Northern Idaho was from Kuchler (1964) and Shantz and Zon (1923).

Wyoming

Information for mapping the forested types in Yellowstone Park came from USDI, National Park Service (1945). The remainder of the area was based on Kuchler (1965) and USDI, Geological Survey (1934a, 1934b). Non-forest information was from the USDI, Geological Survey (1934a, 1934b).

Utah

All information for the mapping of vegetation in Utah came from Deeds (1932).

Nevada

The mapping of forested vegetation in Nevada was based on Wilson (1941). The non-forest vegetation is primarily from Kuchler (1964) with comparisons to Clawson et al (1938).

California

The forest vegetation in California came from USDA, Forest Service (1946) which was refined by USDA, Forest Service (1954).

Siskiyou County information was refined by USDA, Forest Service (1950). Information on non-forest types came from the same sources plus Kuchler (1964).

Oregon

The information for mapping forested vegetation was primarily from county data from the Forest Survey of the 1930's. In a few cases the data was from the 1940's. This information was originally at a map scale of about 1:24000. It was summarized to 1:1000000 for inclusion in the CRB map. Non-forest information was based on Franklin and Dyrness (1973) and Kuchler (1964) . .

Washington

The northeastern portion of Washington was mapped using Kemp and Pissot (1949) to determine forest vegetation. Their map was a generalized cover type map of the Forest Survey county data from the 1930's inventory. This area included Ferry, Stevens, Pend Oreille, Spokane, and Lincoln counties. The process described for Oregon was used for the remainder of the state that is in the CRB. Non-forest vegetation was based on Franklin and Dyrness (1973) and compared to Shantz and Zon (1923) and Kuchler (1964).

INFORMATION SOURCES FOR AGE STRUCTURE ANALYSIS

Montana

Data for the Sections west of the Continental Divide was obtained from unpublished data collected by the 1930's Forest Survey which is stored as Collection 84 in the Archives section of the Mansfield Library at the University of Montana. This area included all or portions of Sections M332B, M333B, M333C and M333D. Age structure for Section M332E was developed from data from USDA, Forest Service (1910a, 1911, 1923, 1927, 1942d, 1942e, 1942f, 1959a). M332D information was developed from Pissot (1948) and USDA, Forest Service (1943b, 1943c, 1959a, 1959b, 1960a, 1960b).

Idaho

The area north of the Salmon River was developed from Forest Survey information using the same approach as employed in western Montana. Data sources included USDA, Forest Service (1937e, 1937f, 1938a, 1938b, 1938c, 1938d, 1938e, 1938f, 1938g, 1938h, 1938i, 1938j). This area includes Section M331A. The age data for southern Idaho was principally from inventories conducted for small areas of the National Forest at various times since they were established. Section M332A age information came from USDA, Forest Service (1923, 1926b, 1927a, 1928a, 1928b, 1929, 1931a, 1931b, 1936b, 1938j). Age data for M332F was developed from a combination of Forest Survey data and Forest inventories. Data sources included USDA, Forest Service (1923, 1927a, 1938j).

Section 342C is primarily a non-forest Section with only scattered tree growth. It includes a portion of eastern Oregon and a minor part of Nevada. Data for age structure was developed form Forest inventories including USDA, Forest Service (1912a). Section 342D is also primarily a non-forested area with age data developed from USDA, Forest Service (1906, 1931a).

Wyoming

Section M331A is found in both Montana and Idaho. Age structure was developed from USDA, Forest Service (1906, 1931a, 1959a, 1960a). Section M331J represents information from USDA, Forest Service (1931a). M331D covers a portion'of Wyoming and is also found in Idaho and Utah. Age data was developed from USDA, Forest Service (1906, 1912a, 1926b, 1931a).

Utah

Only minor portions of M331D and 342B are located in Utah. Data for these types is described in Wyoming and Oregon.

Nevada

Section 341E is the major area in Nevada and is primarily non-forested or woodland types. Age data was not available for these types.

California

Sections M261D and M261G cover the majority of the area in California included in the CRB. Portions of both of these Section are also found in Oregon. Age data was developed from Forest Survey information and included Moravets (1936b) and USDA, Forest Service (1936b, 1946, 1954) in M261G. Information for M261D was developed from USDA Forest Service (1934b, 1936b, 1946, 1954).

Oregon

Forest Survey data was available for all of the counties in Oregon. The following list provides the source of age data for each of the Section. Section M242C is found in both Oregon and Washington and included data from Bolles (1936), Briegleb (1936, 1937), Buell (1936a, 1936b, 1936c), Kemp (1936a), Moravets (1936b), USDA, Forest Service (1934a, 1934b, 1936b). Section 342H includes age information from Briegleb (1936), Kemp (1936a, 1936b), Luridsen (1937), Moravets (1936b, 1937) and Wolf (1937). Section M332G includes a minor portion of Idaho and Washington with the major part in the Blue Mountains of Oregon. Data was developed from Bolles (1937), Buell (1937b), Kemp (1936b, 1936c), Lauridsen (1937), Litchfield (1937), Moravets (1936a, 1937), Sankela (1937a, 1937b), USDA, Forest Service (1938g, 193811, 1938j) and Wolf (1937). Section 342B is primarily in Oregon but is also found in California, Nevada, Utah and Idaho. The

Section is generaliy non-forested with minor areas that are timbered. Age data was developed from Forest Survey information from Morovets (1936b) and USDA, Forest Service (1946, 1954).

Washington

Age data from the Forest Survey was available for the forested portions of Washington. Information for the Sections found in Washington came from the following sources. Section 3421 includes Bolles (1936), Briegleb (1937), Buell (1936a, 1936c), Kemp (1936a, 1936b) and USDA, Forest Service (1937e). Section 331A occurs in Oregon and Idaho also and includes Kemp (1936c), Sankela (1937a, 1937b), and USDA, Forest Service (1937e, 1938c, 1938d, 1938e, 1938g, 1938h, 1938j, 1938i). The northeast corner of Washington and adjacent Idaho are part of Section M333A. Age data was developed from Bolles (1936), Briegleb (1937), Buell (1937a) and USDA, Forest Service (1937c, 1937e, 1937f, 1938a, 1938b, 1938d, 1941c).

REFERENCES

Aldous, Alfred E. 1929. Land classification of the northern Great Plains: Montana, North Dakota, South Dakota and Wyoming. USDI, Geological Survey, Washington DC.

Arno, S.F. 1979. Forest Regions of Montana. USDA Forest Service, Research Paper INT-218, Intermountain Forest and Range Experiment Station, Ogden, UT. 39p.

Ayres, H.B. 1900. The Flathead Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 20th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.245-316.

Ayres, H.B. 1901. Lewis and Clarke Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 21th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.27-80.

Bancroft, Hubert H. & Frances F. Victor. 1981. History of Nevada: 1540-1888. Vintage Nevada Series, University of Nevada Press, Reno, Ne. 828p.

Barrett, Stephen W. 1981. Relationship of Indian-caused fires to the ecology of western Montana forests. USDA, Forest Service, Northern Region, Report No. 4., Missoula, Mt. 198p.

Bolles, W.H. May 1936. Forest Statistics for Chelan County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 14p.

Bolles, W.H. May 1937. Forest Statistics for Baker County, Oregon. USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or. 15p.

Brandegee, T.S. 1899a. Teton Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Wash-ington, D.C. pp.191-212.

Brandegee, T.S. 1899b. Yellowstone Forest Reserve (Southern part). Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.213-216.

Briegleb, Philip A. May. 1936. Forest Statistics for Deschutes County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 11p.

Briegleb, Philip A. March 1937. Forest Statistics for Okanogan County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 15p.

Britton, Carlton M. & Robert G. Clark. 1984. Effects of fire on sagebrush and bitterbrush. In: Proceedings of a symposium, Rangeland Fire Effects. edited by Ken Sanders & Jack Durham et al. USDI, Bureau of Land Management, Idaho State Office, Boise, Id. pp. 22-26.

Buell, Edward D. April 1936a. Forest Statistics for Yakima County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 11p.

Buell, Edward D. May 1936b. Forest Statistics for Klicktat County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 12p.

Buell, Edward D. June 1936c. Forest Statistics for Kittitas County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 12p.

Buell, Edward D. April 1937a. Forest Statistics for Ferry County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment, Station, Portland, Or. 14p.

Buell, Edward D. June 1937b. Forest Statistics for Wallowa County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 14p.

Bunting, Stephen C. 1984. Fire in sagebrush-grass ecosystems: Successional changes. In: Proceedings of a symposium, Rangeland Fire Effects. edited by Ken Sanders & Jack Durham et al. USDI, Bureau of Land Management, Idaho State Office, Boise, Id. pp. 7-11.

Burks, George F. & Adon Poli. December 1950. Area and ownership of forest land in Siskiyou County, California. Forest Survey Release No. 8. USDA, Forest Service, California Forest and Range Experiment Station, Portland, Or. 21p.

Clawson, Marion, Cruz Venstrom & T. Dean Phinney. June 1938. Range lands of northeastern Nevada: There proper and profitable use (A progress report) U.S. Department of Agriculture, Washington, D.C.

Colville, Frederick V. December 1896. The sage plains of Oregon. The National Geographic Magazine Vol 7 No. 12, pp 395-404.

Coville, F.V. 1898. Forest growth and sheep grazing in the Cascade Mountains of Oregon. U.S. Department of Agriculture, Division of Forestry, Bulletin No. 15 U.S. Government Printing Office, Washington, D.C. 54p.

Cowlin, R.W. & F. L. Moravets. February 1938. Forest Statistics for eastern Oregon and eastern Washington. Forest Research Note No. 25. USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or. 26p.

Davis W.L. 1944. Peter John De Smet: The journey of 1840. Pacific Northwest Quarterly, Vol. 35:29-43, **121-142.**

Day, Thomas A. and R. Gerald Wright. January 1985. The vegetation types of Craters of the Moon National Monument. Bulletin No. 38, College of Forestry, Wildlife and Range Management, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Id. 5pp.

Deeds, John F. & Depue Falck. 1932. Land classification report for Utah. USDI, Geological Survey. 15p.

Dunston, C.E. 1910. Reconnaissance of the Targhee National Forest, Idaho and Wyoming. USDA, Forest Service, Targhee National Forest, Region Four, Ogden, Ut. 37p.

Franklin, Jerry F. & C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. USDA, Forest Service General Technical Report, PNW-8, Washington, DC. 340p.

Gannett, Henry. 1899. Forest reserves: The Forests of the United States. Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.1-66.

Gannett, Henry. 1902a. The forest of Oregon. USDI, U.S. Geol. Sur. Professional Paper No. 4. U.S. Government Printing Office, Washington, D.C. 36p.

Gannett, Henry. 1902b. The Forests of Washington. USDI, U.S. Geol. Sur. Professional Paper No. 5. U.S. Government Printing Office, Washington, D.C. 38p.

Gorman, Martin W. 1899. Eastern part of Washington Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.315-350.

Griffen, Gloria. 1951. Early exploration, routes and trails in Nevada. Master of Arts Thesis, University of Nevada, Reno, Ne. 117p.

Hironaka, M., M.A. Fosberg & A.H. Winward. May 1983. Sagebrush-grass habitat types of southern Idaho. Bulletin Number 35. Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Id. 41p.

Hitchcock, C. Leo & Arthur Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Wa. 730p.

Hoyt, W.G. 1935. Water utilization in the Snake River Basin. Water-Supply Paper 657, USDI, Geological Survey, U.S. Government Printing Office, Washington, D.C.

Hutchinson, S.B. March 1942. The Forest situation in Lincoln County, Montana, Forest Survey Release No.20. Forest Survey

Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 54p.

Hutchinson, S.B., P.D. Kemp. 1952. Forest resources of Montana. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, U.S. Government Printing Office, Washington, D.C. 76P.

Johnson, Kendall L. April 1987. Rangeland through time: A photographic study of vegetation change in Wyoming 1870-1986. Miscellaneous Publication 50, Agricultural Experiment Station, University of Wyoming, Laramie, Wy. 188p.

Kemp, Paul D. March 1936a. Forest Statistics for Wasco County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 13p.

Kemp, Paul D. April 1936b. Forest Statistics for Jefferson County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 12p.

Kemp, Paul D. August 1936c. Forest Statistics for Walla Walla, Columbia, Garfield, and Asotin Counties, Oregon. USDA, Forest Service, Pacific Northwest.Forest Experiment Station, Portland, Or. 12p.

Kemp, Paul D. & H.J. Pissot. May 1949. Forest resources of northeast Washington. Station Paper No. 21. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 30p. map.

Kemp, Paul D. & M.B. Dickerman. October 1950. Montana Forest Resource & Industry Statistics. USDA, Forest Service, Station Paper Number 25, Northern Rocky Forest and Range Experiment Station, Missoula, Mt. 49p. map.

Kirkwood, J.E. June 1922. Forest distribution in the Northern Rocky Mountains. Bulletin No. 247, State University Studies Series No. 2, State University of Montana, Missoula, Mt. 180p.

Kuchler, A.W. 1964. Potential natural vegetations of the conterminous United States. Am. Geophs. Soc., N.Y., Spec. Publ. 36. 116p. Revised in 1965 and 1966.

Langelle, H.D., Fred G. Plummer, Arthur Dodwell, T.F. Rixon & J.B. Leiberg. 1903. Cascade Range Forest Reserve, Oregon. USDI, U.S. Geol. Sur. Professional Paper No. 9., Series H, Forestry, 9, U.S. Government Printing Office, Washington, D.C. 298p.

Lauridsen, Morton J. August 1937. Forest Statistics for Grant County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 13p.

Leiberg, J.B. 1899a. Bitterroot Forest Reserve. Dept. of

Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.253-282.

Leiberg, J.B. 1899b. Present conditions of the forested areas in northern Idaho outside the limits of the Priest River Forest Reserve and north of the Clearwater River. Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.373-386.

Leiberg, J.B. 1899c. Priest River Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 19th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.217-252.

Leiberg, J.B. 1900. The Bitterroot Forest Reserve. Dept. of Interior, U.S. Geol. Sur. 20th Annual Report, Part V; Forest Reserves. Washington, D.C. pp.317-410.

Leiberg, J.B. 1904a. Forest Conditions in the Absaroka division. of the Yellowstone Forest Reserve, Mont., and the Livingston and Big Timber quadrangles, Dept. of Interior, U.S. Geol. Sur. Professional Paper No. 29, Series H, Forestry, 9, 148p.

Leiberg, J.B. 1904b. Forest Conditions in the Little Belt Mountains Forest Reserve, Mont., and the Little Belt Mountains quadrangle, Dept. of Interior, U.S. Geol. Sur. Professional Paper No. 30, Series H, Forestry, 9, 75p.

Litchfield, Wickliffe. August 1937. Forest Statistics for Union County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 16p.

Losensky, B. John. 1992. Fire history for Finnegan Ridge, Montana. Unpublished field data, USDA, Forest Service, Lolo National Forest, Missoula, Mt.

May, Richard H. June 1953. A century of lumber production in California and Nevada, Forest Survey Release No. 20. USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca. 28p.

Mooney, Melissa J. July 1985. A preliminary classification of high-elevation sagebrush-grass vegetation in northern and central Nevada. Master of Science Thesis, University of Nevada, Reno, Ne.

Moravets, F.L. May 1936a. Forest Statistics for Harney County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 12p.

Moravets, F.L. May 1936b. Forest Statistics for Lake County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 13p.

Moravets, F.L. June 1937. Forest Statistics for Wheeler County,

Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 15p.

Morris, M.S. 1964. Natural vegetation of Montana. School of Forestry, Montana State University, Missoula, Mt. 1 map.

Morris, William G. June 1934. Lightning storms and fires on the National Forests of Oregon and Washington. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 27p.

Muggler, W.F. & W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. General Technical Report INT-66, USDA Forest Service, Intermountain Forest and Range Experiment Station, Missoula, Mt. 154p.

Muir, John. 1918. Steep trails. Edited by William Frederic Bade, Houghton Mifflin Company, Boston and New York, 391p.

Newell, Frederick H. June 1897. The National Forest Reserves. The National Geographic Magazine, Vol. 8 No.6:177-187.

Park, B.C. 1936. Standard abbreviations and common names for plants in Region One. USDA, Forest Service, Division of Range Management, Regional Office, Missoula, Mt. 48p.

Payne, Gene F. April 1973. Vegetative'rangeland types in Montana. Bulletin 671, Montana State University, Montana Agricultural Experiment Station, Montana State University, Bozeman, Mt. 15p. map.

Pissot H.J. & F.F. Peffer. 1948. Forest resource statistics Cascade County, Montana, U.S. Department of Agriculture, Forest Service, Station Paper 12. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 23p.

Reitz, Louis P. and H.E. Morris. November 1939. Important grasses and other common plants on Montana ranges. Bulletin 375, Montana State College, Agricultural Experiment Station, Bozeman, Mt. 17p.

Ross, R.L. & H.E. Hunter. 1976. Climax vegetation of Montana: based on soils and climate. USDA Soil Conservation Service, Bozeman, Mt. 64p. maps.

Sankela, W.E. April 1937a. Forest Statistics for Morrow County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 11p.

Sankela, W.E. July 1937b. Forest Statistics for Umatilla County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 12p.

Shantz, H.L. & Raphael Zon. October 1924. Natural vegetation: Grassland and desert shrub. In: Atlas of American Agriculture

Part 1, Section E, USDA, Bureau of Agricultural Economics, Government Printing Office, Washington D.C. 29p. map.

Stoddart L.A. 1940. Range resources in Rich County, Utah. Utah Agriculture Station Bulletin 291. Utah Agricultural Experiment Station, Utah State Agricultural College, Logan, Utah. 30p. map.

Tisdale, E.W. February 1979. A preliminary classification of Snake River Canyon grasslands in Idaho. Station Note No. 32. Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Id. 8p.

Tisdale, E.W. & M. Hironaka. May 1981. The sagebrush-grass region: A review of the ecological literature. Bulletin No. 33, College of Forestry, Wildlife and Range Sciences, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, Id. 23p.

Tueller, Paul T. 1975. The natural vegetation of Nevada. Mentzelia Vol 1(1):3-6, 23-28.

U.S. Department of Agriculture, Forestry Division. 1889. Report on Forest conditions of the Rocky Mountains, and other papers. Bulletin No. 2, USDA, Forestry Division, Washington Government Printing Office, Washington DC. 137p.

U.S. Department of Agriculture, Forest Service. October 1905. Instructions for making forest maps and surveys. USDA, Forest Service, Washington Office, Washington, DC. 10p.

U.S. Department of Agriculture, Forest Service. November 1906. A working plan for a portion of the Red Rock Range in the Henrys Lake National Forest, Idaho. USDA, Forest Service, Idaho, Region 4, Ogden Ut. 10p.

U.S. Department of Agriculture, Forest Service. August 1908a. Report on examination of West Pine Creek Watershed, District 5, Weiser National Forest, Idaho. Region 4, Ogden Ut. 17p.

U.S. Department of Agriculture, Forest Service. October 1908b. Report on examination of Weiser River Watershed, Township 18 N., Ranges 1 E., & 1 W., Weiser National Forest, Idaho. Region 4, Ogden Ut. 13p.

U.S. Department of Agriculture, Forest Service. August 1909. Report on examination of forest conditions on a portion of the Indian Creek Watershed, Weiser National Forest, Idaho. Region 4,. Ogden Ut. 6p.

U.S. Department of Agriculture, Forest Service. 1908-1911. Preliminary report on forest survey Upper Weiser River Watershed, Weiser National Forest, Idaho. Region 4, Ogden Ut. 9p.

U.S. Department of Agriculture, Forest Service. 1910a. Salmon

Forest survey: Lake, Camp, Deer, Rattlesnake and Iron Creeks, Salmon National Forest, Idaho. Region 4, Ogden Ut. 30p.

U.S. Department of Agriculture, Forest Service. 1910b. Reconnaissance estimate and report on the Big Wood River Watershed, Sawtooth National Forest, Idaho. Region 4, Ogden Ut.

U.S. Department of Agriculture, Forest Service. 1911. Forest survey, Salmon National Forest, Idaho. Region 4, Ogden Ut.

U.S. Department of Agriculture, Forest Service. 1912a. Timber reconnaissance Goose Creek logging chance. Idaho National Forest, Idaho. Region 4, Ogden Ut. 6p.

U.S. Department of Agriculture, Forest Service. September 1912b. Report on examination of a proposed timber sale on West Fork of Weiser River in Sections 8, 17, 18 and 20, T. 18 N., R 1 W. Weiser National Forest, Idaho. Region 4, Ogden Ut. 6p.

U.S. Department of Agriculture, Forest Service. April 1914a. Principles and procedure governing the classification and segregation of agricultural and forest lands in the National Forests. Folder: U Classification - General - 1912-1916. F.R.C. Box #95-67E.0437 National Archives, Pacific NW Region, Seattle, Wa. 17p.

U.S. Department of Agriculture, Forest Service. 1914b. Classification for the Washakie Forest. F.R.C. Box 59-A-199-30/4/2:1-2:6, National Archives, Rocky Mt. Region, Denver, Co.

U.S. Department of Agriculture, Forest Service. 1920. 2410 Plans, Preliminary Management Plan, Minidoka National Forest. F.R.C. Box #95-73C.835 National Archives, Pacific NW Region, Seattle, Wa.

U.S. Department of Agriculture, Forest Service. 1921. 2410 Plans, Burley-Oakley Working Circle, Sawtooth National Forest. F.R.C. Box #95-73C.835 National Archives, Pacific NW Region, Seattle, Wa. 45p.

U.S. Department of Agriculture, Forest Service. 1923?. 2410 Plans, Wood River-Salmon River Working Circle, Challis National Forest. F.R.C. Box #95-73C.835 National Archives, Pacific NW Region, Seattle, Wa.

U.S. Department of Agriculture, Forest Service. May 1926a. The National Forests of Idaho. Miscellaneous Circular No. 61. USDA, Forest Service, Washington Government Printing Office, Washington, DC. 34p.

U.S. Department of Agriculture, Forest Service. 1926b. S Plans, Green River Working Circle management plan, Wasatch National Forest, Idaho. Region 4, Ogden Ut.

U.S. Department of Agriculture, Forest Service. 1927-8. S Folder:

2410 Plans, South Fork of Boise River Working Circle management plan, Challis National Forest, Idaho. F.R.C. Box #95-73C.835 National Archives, Pacific NW Region, Seattle, Wa. 35p.

U.S.U.S. Department of Agriculture, Forest Service. February 1927. National Forests of Wyoming. Miscellaneous Circular No. 82. USDA, Forest Service, Washington Government Printing Office, Washington, DC. 26p.

U.S. Department of Agriculture, Forest Service. 1928a. S Management Plan, Mann Creek Working Circle, Weiser National Forest, Idaho. Region 4, Ogden, Ut.

U.S. Department of Agriculture, Forest Service. 1928b. S Management Plan, Meadows Valley Working Circle, Idaho and Weiser National Forest, Idaho. Region 4, Ogden, Ut.

U.S. Department of Agriculture, Forest Service. 1929. S Management Plan, South Fork Salmon Working Circle, Payette and Idaho National Forest, Idaho. Region 4, Ogden, Ut.

U.S. Department.of Agriculture, Forest Service. 1931a. Revision of Capper Report. F.R.C. Box #95-90-025 National Archives, Intermountain Region, Denver, Co.

U.S. Department of Agriculture, Forest Service. 1931b. S Management Plan, Payette Lakes Circle, Idaho National Forest, Idaho. Region 4, Ogden, Ut.

U.S. Department of Agriculture, Forest Service. 1931c. S Management Plan, Council Working Circle, Weiser National Forest, Idaho. Region 4, Ogden, Ut.,

U.S. Department of Agriculture, Forest Service. March 1934a. Forest statistics for western Washington Counties from inventory phase of Forest Survey. Forest Survey Statistical Service, USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or.

U.S. Department of Agriculture, Forest Service. 1934b? Forest statistics for western Oregon Counties from inventory phase of Forest Survey. Forest Survey Statistical Service, USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or.

U.S. Department of Agriculture, Forest Service. Revised April 1935a. Instructions for the inventory phase of the Forest Survey of the Inland Empire Region for lands other than National Forest. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 104p.

U.S. Department of Agriculture, Forest Service. October 1935b. The forestry problem in the Columbia River Basin States. Appendix

N of Report on Columbia Basin by Pacific Northwest Regional Planning Commission. Box No. 95-69A367/78150 Folder: statistics-Special, National Archives, Pacific NW Region, Seattle, Wa. 42p.

U.S. Department of Agriculture, Forest Service. February 1936a. The Forest Survey of eastern Oregon and eastern Washington. Forest Survey Statistical Service, USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or. 8p.

U.S. Department of Agriculture, Forest Service. February 1936b. Forest Statistics for Klamath County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 11p.

U.S., Department of Agriculture, Forest Service. 1936c. S Management Plans, Middle Valley Working Circle, Weiser National Forest. Region 4, Ogden, Ut.

U.S. Department of Agriculture, Forest Service. 1937a. S Management Plan, Indian Valley Working Circle, Weiser National Forest. Region 4, Ogden, Ut.

U.S. Department of Agriculture, Forest Service. 1937b. R Special Range. Report R-4 Statements regarding range and grazing history by J.M. Stover, Eph Ricks, Mr. Philbrick, E.C. Vahlbery and E.N. Wiggins. Region 4, Ogden, Ut. 12p.

U.S. Department of Agriculture, Forest Service. March 1937c. Forest Statistics Pend Oreille County, Washington. Forest Survey Release No. 2; A March 1937 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 24p.

U.S. Department of Agriculture, Forest Service. April 1937d. The inventory phase of the Forest Survey Northern Rocky Mountain Region: Definition of the procedure, terms, and classifications. Forest Survey Release No. 3. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. May 1937e. Forest Statistics Spokane County, Washington. Forest Survey Release No. 4; A May 1937 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 24p.

U.S. Department of Agriculture, Forest Service. June 1937f. Forest Statistics Stevens County, Washington. Forest Survey Release No. 5; A June 1937 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 24p.

U.S. Department of Agriculture, Forest Service. 1938a. Forest

Statistics: Boundary County, Idaho. Forest Survey Release No. 6; A July 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 30p.

U.S. Department of Agriculture, Forest Service. 1938b. Forest Statistics: Bonner County, Idaho. Forest Survey Release No. 7; A August 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 31p.

U.S. Department of Agriculture, Forest Service. 1938c. Forest Statistics: Benewah County, Idaho. Forest Survey Release No. 8; A September 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 3op.

U.S. Department of Agriculture, Forest Service. 1938d. Forest Statistics: Kootenai County, Idaho. Forest Survey Release No. 9; A December 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 35p.

U.S. Department of Agriculture, Forest Service. 1938e. Forest Statistics: Latah County, Idaho. Forest Survey Release No. 10; A January 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 32p.

U.S. Department of Agriculture, Forest Service. 1938f. Forest Statistics: Shoshone County, Idaho. Forest Survey Release No. 11; A February 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 32p.

U.S. Department of Agriculture, Forest Service. 1938g: Forest Statistics: Nez Perce County, Idaho. Forest Survey Release No. 12; A March 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 28p.

U.S. Department of Agriculture, Forest Service. 1938h. Forest, Statistics: Lewis County, Idaho. Forest Survey Release No. 13; A May 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 28p.

U.S. Department of Agriculture, Forest Service. 1938i. Forest Statistics: Clearwater County, Idaho. Forest Survey Release No. 14; A June 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 35p.

U.S. Department of Agriculture, Forest Service. 1938j. Forest Statistic's: Idaho County, Idaho. Forest Survey Release No. 15; A September 1938 Progress Report. USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt.

31p.

U.S. Department of Agriculture, Forest Service. July 1938k. The Forest Survey of the Douglas-fir region. USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Or. 9p.

U.S. Department of Agriculture, Forest Service. April 1941a. Northern Idaho's Forest Problem 1941. Forest Survey Release No. 19; Progress Report of the Forest Survey, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. Published in cooperation with the University of Idaho Forest School, 24p. map.

U.S. Department of Agriculture, Forest Service. August 1941b. Forest Statistics for Northern Idaho. Number 1. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 17p.

U.S. Department of Agriculture, Forest Service. October 1941c. Forest Statistics for Lincoln County, Montana, Number 2. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 13p.

U.S. Department of Agriculture, Forest Service. October 1941d. Forest Statistics for Flathead County, Montana, Number 3. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 13p.

U.S. Department of Agriculture, Forest Service. December 1941e. Forest Statistics for Lake County, Montana, Number 4. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 13p.

U.S. Department of Agriculture, Forest Service. December 1941f. Forest Statistics for Sanders County, Montana, Number 5. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 13p.

U.S. Department of Agriculture, Forest Service. December 1941g. Forest Statistics for Mineral County, Montana, Number 6. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. December 1941h. Forest Statistics for Missoula County, Montana, Number 7. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. March 1942a. An analysis of National Forest range problems in northeastern California, USDA, Forest Service, Region 5 and California Forest and Range Experiment Station, Berkeley, Ca.

U.S. Department of Agriculture, Forest Service. June 1942b. Highlights of the Missoula County Forest situation, Number 8. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

U.S. Department of Agriculture, Forest Service. June 1942c. Highlights of the Forest situation in Lewis and Clark County (west of the Continental Divide), Number 9. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. June 1942d. Highlights of the Forest situation in Deerlodge County (west of the Continental Divide), Number 10. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of *Agriculture, Forest Service. June 1942e. Highlights of the Forest situation in Silverbow County (west of the Continental Divide), Number 11. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. June 1942f. Highlights of the Forest situation in Powell County, Number 12. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

U.S. Department of Agriculture, Forest Service. June 1942g. Highlights of the Forest situation in Granite County, Number 13. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 14p.

U.S. Department of Agriculture, Forest Service. June 1942h. Highlights of the Forest situation in western Montana, Number 14. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 19p.

U.S. Department of Agriculture, Forest Service. June 1943a. Highlights of the Forest situation in Chouteau County, Number 15. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

U.S. Department of Agriculture, Forest Service. September 1943b. Highlights of the Forest situation in Fergus County, Number 16. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

U.S. Department of Agriculture, Forest Service. October 1943c. Highlights of the Forest situation in Judith Basin County, Number 17. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Mt. 15p.

U.S. Department of Agriculture, Forest Service. April 1944. Highlights of the Forest situation on the National Forests of western Montana, Number 18. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Mountain Forest and Range Experiment Station; Missoula, Mt. 26p.

U.S. Department of Agriculture, Forest Service. March 1946. Forest areas, timber volumes and vegetation types in California. Forest Survey Release No. 4. USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca. 59p.

U.S. Department of Agriculture, Forest Service. December 1954. Forest statistics for California. Forest Survey Release No. 25. USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca. 61p.

U.S. Department of Agriculture, Forest Service. 1959a. Timber management plan: Beaverhead National Forest, Ruby-Madison Working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. 1959b. Timber management plan: Helena National Forest, Helena Working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. 1959c. Timber management plan: Helena National Forest, Lincoln working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. 1959d. Timber management plan: Gallatin National Forest, Gallatin Working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. 1960a. Timber management plan: Gallatin National Forest, Yellowstone Working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. 1960b. Timber management plan: Lewis and Clark National Forest, Four Rivers Working Circle, Montana. 2410 Plans, USDA, Forest Service, Region One, Missoula, Mt.

U.S. Department of Agriculture, Forest Service. January 1977. Proceedings of the western juniper ecology and management

workshop, Bend, Oregon. USDA, Forest Service General Technical Report PNW-74. Pacific Northwest Forest and Range Experiment Station, Portland, Or.

U.S. Department of Interior, Geological Survey. 1898. Annual reports of the Department of the Interior. USDI, Geological Survey, 19th Annual Report, Part I, Washington, D.C. pp.122-127.

U.S. Department of Interior, Geological Survey. 1931. Land classification of the central Great Plains Part l-5. USDI, Geological Survey, Washington DC.

U.S. Department of Interior, Geological Survey. 1934a. Land classification southwest Wyoming. USDI, Geological Survey, Washington DC. 1 map.

U.S. Department of Interior, Geological Survey. 1934b. Land classification'northwest Wyoming. USDI, Geological Survey, Washington DC. 1 map.

U.S. Department of Interior, National Park Service. 1945. Vegetation type map, part of the master plan for Yellowstone National Park. USDI, National Park Service, Branch of Forestry, Washington DC. 2 maps.

Vale, Thomas R. 1975. Presettlement vegetation in the sagebrush-grass area of the Inter-mountain west. Journal of Range Management Vol. 28(1), pp. 32-36.

Van Hooser, Dwane D., Noel D. Cost & H. Gyde Lund. 1993. The history of the forest survey program in the United States. In: Forest resource inventory and monitoring and remote sensing technology; proceedings of the IUFRO Centennial Meeting Aug. 31-Sept. 4, 1992. Japan Society of Forest Planning Press, Faculty of Agriculture, Tokyo University of Agriculture and Technology, 3-4-8 Saiwaicho, Fuchu, Tokyo, 183 Japan. pp. 19-27.

Wieslander, A.E. & Herbert A. Jensen. March 1946. Forest Areas, timber volumes and vegetation types in California. Forest Survey Release No. 4 USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca. 32p.

Wilson, Alvin K. 1962. Timber resources of Idaho. Forest Survey Release Number 3, USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, Ut. 42p map.

Wilson R.C. August 1941. Vegetation types and forest conditions of Douglas, Ormsby and southwestern Washoe Counties, Nevada. Forest Survey Release No. 2. Forest Survey Statistical Service, USDA, Forest Service, California Forest and Range Experiment Station, Berkeley, Ca.

Winward, A.H. 1984. Fire in the sagebrush-grass ecosystem - The ecological setting. In: Proceedings of a symposium, Rangeland

Fire Effects. edited by Ken Sanders & Jack Durham et al. USDI, Bureau of Land Management, Idaho State Office, Boise, Id. pp. 2-6.

Wolf, Harry M. May 1937. Forest Statistics for Crook County, Oregon. USDA, Forest Service, Pacific Northwest Forest Experiment Station, Portland, Or. 13p.

Woolley, Ralf R. 1946. Cloudburst floods in Utah, 1850-1938. Geological Survey Water-supply Paper 994. USDI, Geological Survey, Washington DC. 128p. map. (compiled by Conservation Branch, 1931).

Work, Herman. 1913. The Salmon Forest, its resources and their relation to the community. Masters Thesis, Pennsylvania State College, State College, Pa.

Wright, Henry A. 1984. Effects of fire on grasses and forbs in sagebrush-grass communities. In: Proceedings of a symposium, Rangeland Fire Effects. edited by Ken Sanders & Jack Durham et al. USDI, Bureau of Land Management, Idaho State Office, Boise, Id. pp. 12-21.

Young, James A. & Jerry D. Budy. July 1979. Historical use of Nevada's pinyon-juniper woodlands. Journal of Forest History Vol. 23; No.3, pp. 112-121.

Youngblood, Andrew P., Wayne G Padgett & Alma H Winward. December 1985. Riparian community type classification of eastern Idaho - western Wyoming. R4 Ecol-85-01, USDA Forest Service, Intermountain Region, Ogden, Ut. 78p.

Zach, L.W. & S.B. Hutchinson. undated. The Forest situation in Ravalli County, Montana. Forest Survey Statistical Service, USDA, Forest Service, Northern Rocky Forest and Range Experiment Station, Missoula, Mt. 48p.