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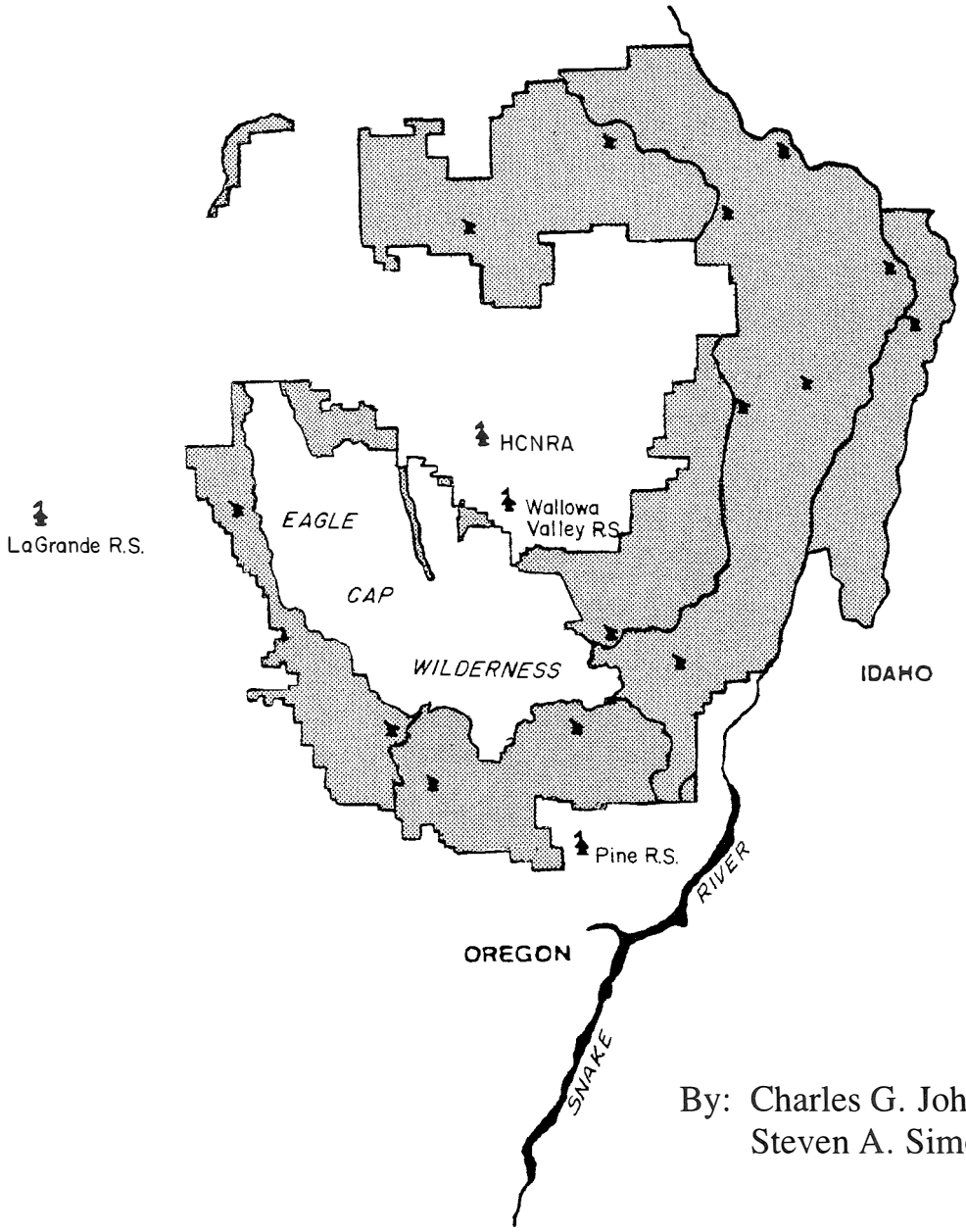
June 1987

Plant Associations of the Wallowa-Snake Province

Wallowa-Whitman National Forest



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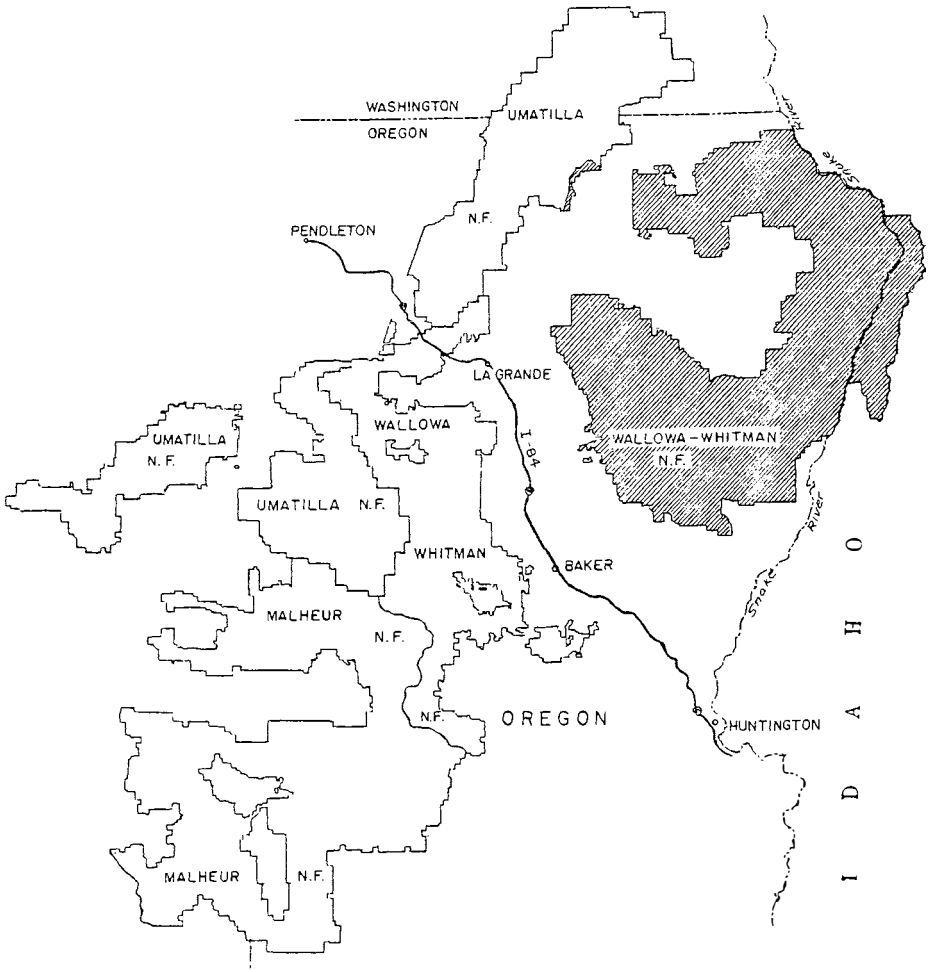
Introduction

The Wallowa-Snake Province plant association classification pertains to those Federal lands administered by the USDA Forest Service of the Wallowa-Whitman National Forest exclusive of the Blue Mountains. This first approximation of the plant associations has focused on mid and late seral vegetation of the steppe, shrub-steppe, and forests of the Wallowa-Snake Province. It is anticipated that earlier seral vegetation will be more fully studied as a series of investigations following these primary studies. In addition, there is a need to further refine the moist and wet site vegetation classification (i.e., meadows, riparian). The subalpine ecosystem in the Seven Devils and Wallowas has been deferred for future investigation with high elevation areas of the Blue Mountains.

Users should approach the work of this publication as a pioneering effort to be improved by the field investigator through communication with the authors. Information has been provided in two formats to achieve user feedback. The formal publication is designed to provide a professional land manager with a high level of technical information through descriptive prose, tables, and summary graphics. A field guide is also provided for employees who seek to determine the community in the field.

It is hoped that the use of these publications by land managers of the National Forest will improve our tutelage of the various multiple resources constituting the ecosystems of the Wallowa-Whitman National Forest.

Wallowa-Snake Province - Location



The Wallowa Mountain and Seven Devils uplifts, the dissected basalt plateau, and the canyonlands of the Snake, Grande Ronde, and Imnaha Rivers constitute this physiographic province. The location is in the extreme northeast corner of Oregon with the adjacent Seven Devils-Snake River Canyon of Idaho included. The Grande Ronde Valley separates the area from the Blue Mountains.

Elevational extremes range from subalpine summits of the Wallowas and Seven Devils (often above 9,000 feet) to canyon bottoms often below 2,000 feet. The highest point of the Province is atop the Matterhorn (9,845 feet). This study excluded alpine vegetation found at these highest elevations. The highest elevation sample used in the study was a green fescue/spurred lupine community at 7,600 feet. The lowest elevation in the Province occurs at the northern exit of the Snake River from the National Forest (870 feet).

Climate

Several climatic zones are represented in the Wallowa-Snake Province due to the great elevational, geographic, and topographic diversity common in the area. The resulting diversity in landscapes often creates major variation in climate over relatively short distances. However, the major influence to the regional climate comes from the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against the modifying effects of moist winds from the Pacific Ocean and as a result, the climate of the Province is essentially continental and dry. In general, climate for much of the area falls within the Temperate Continental - cool summer phase (Trewartha, 1968), where mean temperature is less than 72 degrees F. in the warmest month and 50 degrees F. for more than three months. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine, and wide ranges in temperature are characteristic, but there are marked local differences in temperature and precipitation due to local topography. For example, summer and winter temperatures in the Grande Ronde Valley located on the western edge of the Province may be greatly moderated by marine air moving up the Columbia River from the Pacific Ocean. This marine influence is substantially less in the Wallowa Valley north of the Wallowa Mountains where low temperatures in the winter months may be due to the drainage of cold air from the surrounding high mountain slopes.

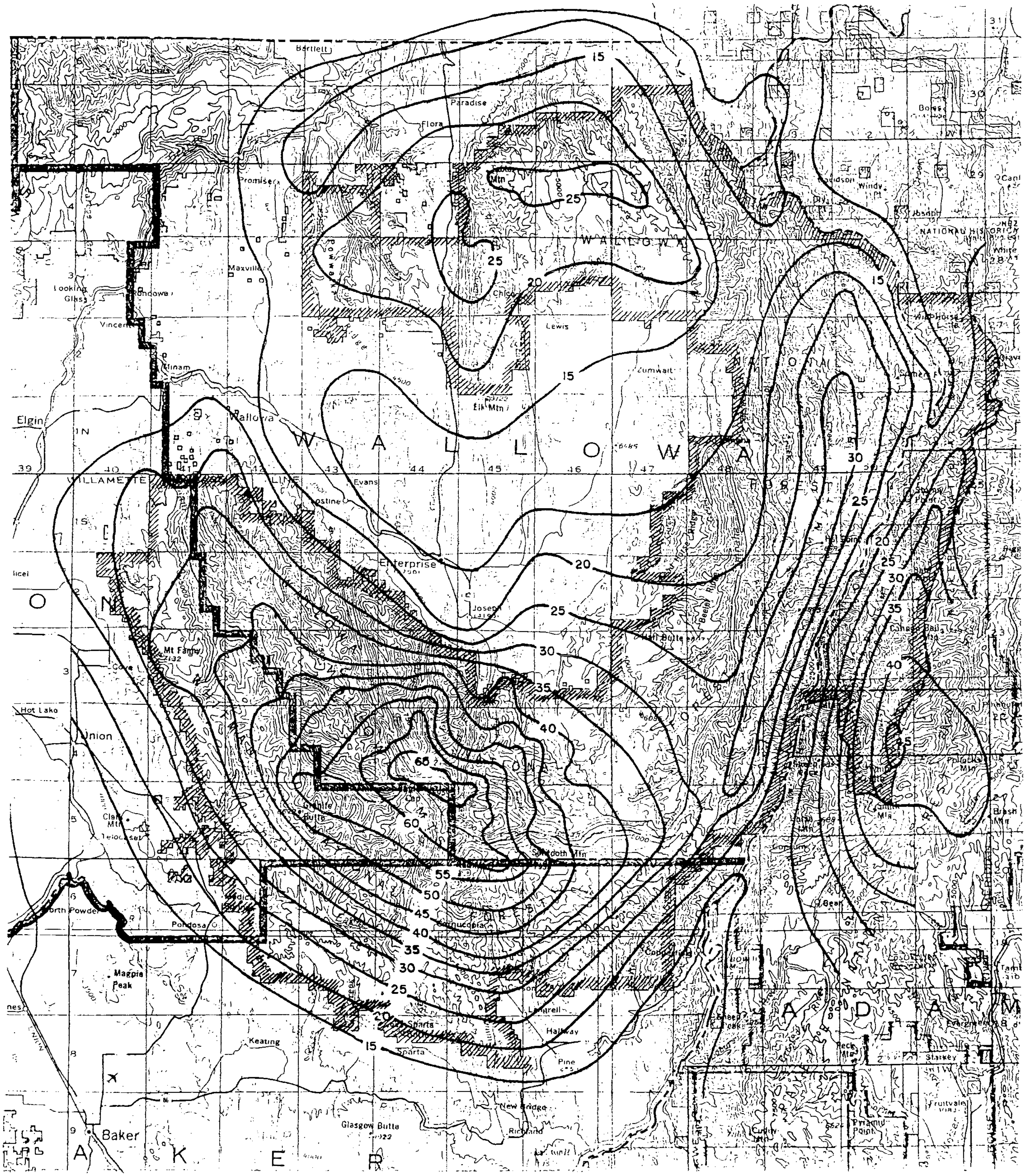
Summer rainfall commonly occurs with convectional storms promoted by strong insolation and masses of cool air that cross the Cascades and spread over the Province at high elevations. The associated lightning storms are an important factor in the inception of forest fires. Lightning events appear to be more frequent in the Province when summer high pressure systems are associated with moisture from southwesterly flows of air. Winter climatic conditions are noticeably influenced by maritime air borne eastward on prevailing westerly winds. Cold waves may result from the approach of a high pressure system from the west carrying moderately low temperature or from cold air drawn in from an Arctic high pressure system. In both cases, the air is further cooled by nocturnal radiation enhanced by lack of winter cloud cover.

The most marked climatic differences in the Province are in total annual precipitation and seasonal temperature extremes, both of which can be attributed to the influence of topographic and elevational factors. In general, winters are quite severe above 6,500 feet in the Seven Devils in Idaho and the Wallowas in Oregon; warm summers and moderately severe winters occur at mid-elevation plateau areas; and hot summers and mild winters occur at low elevations in the deeper canyons. Although little data is available for areas at the elevational extremes throughout the Province, it is apparent that there may be as little as 10 inches of moisture at the lowest elevations in the canyons with moisture along high mountain peaks often exceeding 50 inches. As a rule of thumb, precipitation increases approximately 5 inches with each 1,000 foot rise in elevation (USDA, 1979). Typically, precipitation in the grand fir zone at mid elevation plateau areas is 25% to 40% higher than in the bunchgrass steppe zone at lower elevations along canyon slopes (Johnson, 1981).

The heaviest precipitation is generally in the winter months, but there is a secondary maximum in May and June and in some localities this becomes the principal maximum (USDA, 1936). At elevations below 4,000 feet about half of the total precipitation occurs during the winter months when average temperatures are near

or below freezing (NOAA, 1980). Average winter snowpacks above 5,000 feet elevation exceed 61 inches in depth and represent well over two-thirds of the total yearly precipitation in these areas (USDA, 1973).

Generally, the normal temperatures for the warmest and coldest months differ by as much as 50 degrees F. The diurnal range of temperature is greater over the plateau than it is along the Snake River. In some portions of the plateau, it is extreme; averaging 28 degree F. in midwinter and 48 degrees F. in midsummer. Above 6,000 feet elevation, mean January temperature is around 14 degrees F., while in areas below 3,000 feet mean January temperature is around 30 degrees F. Mean summer temperatures below 3,000 feet range from 80 to 90 degrees F. in the deep canyons where daily maximums often exceed 100 degrees F. Above 6,000 feet elevation, July temperatures average 54 degrees F.



Bartlett
Paradise
Flora
Promise
Maxville
Looking Glass
Vincent
Elgin
Wallowa
Lostine
Evans
Enterprise
Joseph
Lewis
Chico
Zumwalt
Elk Mtn
W A L L O W A
NATIONAL HISTORIC
Windy
Joseph
Mt Fanny
Cove
Hot Lake
Union
Clark Mtn
North Powder
Pondosa
Magpie Peak
Keating
Baker
A K E R
Cornucopia
Sawtooth Mtn
Sparta
Halfway
Pine
New Bridge
Richland
Glasgow Butte
A D A M
Starkey
Fruitvale
15
20
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Geology

Columbia River basalts dominate the Province with the Wallowa Mountain uplift interrupting the gentle topography created by these flows. Also creating disruptions are the Seven Devils uplift on the extreme east and deeply dissected canyons pertaining to the Snake, Imnaha, and Grande Ronde River systems. The results of mountain-building, faulting, and subsequent erosion of the basalt plateau by water transport has resulted in 9,000 foot subalpine mountain peaks located adjacent to the Snake River Canyon, the deepest in North America. Environmental differences resulting from the elevational influence coupled with variation in parent material and soils have strongly influenced the plant communities that occur throughout this very diverse geographic province.

The oldest rocks in the Wallowa-Snake Province pertain to the Clover Creek Formation of the late Paleozoic Era (250 million years ago). These greenstones are visible in the Wallowa Mountains where the andesitic core was exposed during the Mesozoic Era when the Wallowas uplifted (Baldwin, 1964). In the late Paleozoic and early Mesozoic the Seven Devils metavolcanics were formed. The large Wild Sheep Formation contains these rock units and is prominently displayed as an undifferentiated mass beneath the Columbia River basalt flows from Pittsburg Landing downriver to Copper Creek. It contains some of the harshest environments for plant growth (i.e., spiny greenbush, bluebunch wheatgrass-Sandberg's bluegrass/Cusick's milkvetch plant communities) that are found in the canyonlands of the Province.

The Mesozoic era (225-65 million years ago) was a time of active volcanicism in northeastern Oregon. In the Triassic period of this era, the granites of the Snake River Canyon were formed. Major units are exposed beneath Columbia River basalts in the vicinity of Pittsburg Landing and near the mouth of the Imnaha River. Communities of the bluebunch wheatgrass-Sandberg's bluegrass (granite) plant association occur on these sites. The granitic batholith of the Wallowas with the associated limestones of the Martin Bridge Formation, and slates, shales, and sandstones of the Hurwal Formation were formed about 100 million years ago in the Cretaceous Period. These formations are exposed in the Eagle Cap Wilderness and support plant communities specific to higher elevations and severe climatic conditions. These are generally not described in this study.

The Cenozoic Era (65 million years ago) provided widespread volcanicism which resulted in the formations of Columbia River basalts layered over much of northeastern Oregon surrounding the Wallowa uplift. During the Miocene (15 million years ago) molten lava poured from many simultaneously erupting fissures across the landscape covering much of the previous landforms (McKee, 1972). The down-cutting by the principal rivers and tributaries has enabled us to witness the depth and layers of basalt resulting from repeated episodes of vulcanism. Lavas pooled to 200 feet in thickness in some flows while most were formed 50-100 feet thick. Feeder dikes for some of these local eruptions (Taubeneck, 1970) are highly visible in the glacially scoured canyon slopes within the Wallowa Mountain granidiorites. Excellent examples of these dikes can be seen on the face of the Matterhorn. Good views of the contact between the basalts and earlier geologic formations can be seen in the Snake River Canyon upriver from Pittsburg Landing. The Saddle Creek drainage provides an especially dramatic contrast.

Two major erosive activities have occurred to shape the landforms of the Wallowa-Snake that we see today. During the Pliocene (10 million years ago) the Snake River succeeded in cutting its northerly path through the Seven Devils-Wallowa

Mountain uplifts. The spilling of Lake Bonneville into the Snake River system probably doubled the erosive power of the Snake as it carved the impressive gorge through to the Columbia River. Tributary rivers like the Grande Ronde and Imnaha with their associated streams transported great amounts of sediments through mass wasting resulting from the disintegration and decomposition of the basaltic rock. This resulted in the exposure of the basaltic layers and oversteepened sideslopes so common in the Snake-Imnaha canyonlands. Differential erosion of the Columbia River Basalts in the lower Imnaha River Canyon, and the Snake River Canyon upriver from the Imnaha mouth to Saddle Creek in Oregon and Pittsburg landing in Idaho, has resulted in a well-defined "bench". The bench is especially prominent when viewing Cow, Lightning, and Horse Creeks from Cactus Mountain or Buckhorn Lookout. The older, more resistant basalt of the Picture Gorge or Imnaha formation (Kleck, 1976) has been shaped into gentle slopes by these streams and rivers while the upper Yakima formation has been more readily eroded leaving a steepened, layered flow formation that defines the intervening ridges and plateaus so characteristic of Windy, Sleepy, and Haas Ridges.

The other major erosive event occurred with the Pleistocene glaciations of the Wallowa and Seven Devils. The Wallowas were glaciated at least three times and perhaps as many as seven times between 11,000 and 500,000 years ago (Crandell, 1965). The Bennett Glacier scoured the West Fork of the Wallowa River for almost 20 miles, was 2,000 feet thick, and left a nearly perfect terminal moraine which today encloses Wallowa Lake. Other major glaciated landforms are present in the upper Imnaha, Minam, Lostine, and Eagle Creeks of the Wallowas while classical sculpting by glacial activity has resulted in cirques and basins in both the Wallowas and Seven Devils.

Other important formative events influencing the nature of our vegetation have been ash depositions by Glacier Peak (12,000 years ago) and Mt. Mazama (6,600 years ago). Our most productive forested plant associations result on deposits of these ashy soils. Wind-blown loess from the central Washington scablands deposited since the glacial period has influenced the productivity and composition of our fescue-dominated grasslands. The deposition of sediments, possibly during the Bonneville Flood, has resulted in major landforms (i.e., Pittsburg Landing, Big Bar, Johnson Bar) which are in stark contrast to the precipitous walls of pre-Tertiary metavolcanics. Other depositional features include rotational slumps and major landslides which are frequently encountered in the canyons (i.e., Bernard Creek).

Soil Characteristics

Soils in the Wallowa-Snake Province are quite variable and may range from those on thin, rocky, low-productivity ridgetop scablands to those in deep ash accumulations on very productive grand fir sites. Soil differences result from variations in climate, topography, parent material, vegetation, and time. The greatest influence to soils in this area has come from ash deposited primarily from Mt. Mazama and Glacier Peak approximately 6,600 and 12,000 years ago respectively (Fryxell 1965). Perhaps of equal impact, especially in the northern dissected basalt plateau, has been the deposition of loess from the central Washington channeled scablands region prior to and following the recession of the Continental Glacier during the Pleistocene (1 million years ago). These deposits have virtually blanketed the entire Province but over time much of the material has been eroded away by wind and water. Continued weathering of the basalts and other rock types at high elevations in the Wallowas and low elevations in the canyons has resulted in a mixing of wind-borne ash and loess with rocky colluvium in many areas. Consequently soils of the Province fall under one of the following broad categories:

1. Residual - derived in place from predominately bedrock or colluvial rock materials.

2. Ash-Loess - derived from deposited and accumulated ash and/or loess over older buried soil material.

3. Mixed - derived from colluvium, ash and/or loess mixed well in surface layers over older buried soil material.

Distribution of plant communities often follows these broad soil categories. Bluebunch wheatgrass communities, scabland communities, and xeric shrublands occur on soils with little influence from loess while Idaho fescue-prairie junegrass, and mesic shrublands occur on soils that are highly loess influenced. The Idaho fescue-bluebunch wheatgrass communities occur on soils between these extremes. Similar patterns are evident in forested plant communities. The presence of ash in soil layers indicates sites capable of supporting stable grand fir or subalpine fir communities. Communities in the Douglas-fir and ponderosa pine series occur on soils with little or no ash influence. Douglas-fir appears to form long-term stable communities only where loess influence is sufficient but is at a competitive disadvantage with ponderosa pine on residual soils and those with little or no loess influence. Abrupt boundaries between soil categories and individual soils may exist but much more often there is a gradual shift from dominance by one material (ash, loess, or residual parent material) over another. This continuum in soil often provides transitional areas between differing plant associations where a mixing of species occurs resulting in communities with attributes of each.

Productivity of forested and non-forested plant communities is also closely related to ash and loess content in soils. Unique characteristics of ash soils include high water holding capacity, high water infiltration rates, low compactability, high detachability and disproportionately high amounts of nutrients in upper surface layers. Under undisturbed conditions these soils support good vegetation cover which protects the ash from erosion. Since the greatest concentration of nutrients for plant growth occurs in the upper six

inches of these soils, even slight erosion can result in significant reduction in productivity. The importance of ash to the productivity of soils can be demonstrated by comparing plant cover and stockability (GBA) between communities in the Douglas-fir and grand fir associations at the same approximate elevation. Grand fir communities are almost always located on highly ash-influenced soils. Douglas-fir communities are not. On the average, grand fir communities have greater than 25% cover of trees and well over 50% greater potential stockability for Douglas-fir than do communities in the Douglas-fir series.

Loess may also provide important qualities to many soils. Loessial deposits are normally high in base saturation (can hold a large amount of nutrients), have high content of weathered minerals and are thus high in nutrient reserve, and generally have excellent physical properties. The importance of loess to productivity of soils can be demonstrated by comparing plant cover and forage dry weight in communities in the Idaho fescue-prairie junegrass associations and those in the bluebunch wheatgrass/Sandberg's bluegrass associations at the same approximate elevation. Total cover and dry weight of plants is nearly three times greater in FEID-KOCR communities where soils are loess-derived than in AGSP/POSA3 communities where soils are generally residual in origin.

Differentiation between ash and loess can be difficult. When wet, volcanic ash is typically yellowish brown. After being colored by organic matter as in surface soils it is darker brown. When wet, unweathered loess is gray but weathers quickly to a buff color. Under many bunchgrass stands the surface loess layers are highly colored by organic matter and are black to very dark brown. Ash soils have a silt loam or loamy fine sand texture. Loess soils also have a silt loam texture, but often have a more silty texture and may feel a bit stickier due to their higher clay content.

Other soil properties that appear important to plant community distribution and productivity include: rock fragment content, depth of surface soil material, rooting depth, and presence of clay concentrations. All of these properties have some influence on water holding capacity which is especially critical in the Wallowa-Snake Province where summer precipitation is often limited. Rock fragments of all sizes detract from the total soil volume and can substantially reduce the water storage capability of soils. Rock fragment size affects movement of water through the soil. Soil discussions in this publication define both percentage rock fragments and size and can be used to judge the dryness of sites. Total soil depth may be misleading when determining productivity differences between sites since soil water and nutrients are held most abundantly in only upper portions of the soil. Depth of surface soil material and rooting depth are used to indicate this zone of more available soil and water. Rooting beyond these levels into subsurface water sources is also indicated for some types. The last property used to demonstrate soil moisture capability is clay content. Clay layers tend to hold large quantities of water, although some of this water may be unavailable to plants. On otherwise rocky, dry soils, clay may ameliorate site conditions making it possible for less drought-tolerant plants and communities to exist. These characteristics help in the placement of communities into their proper association and also in judging which portion of the range (wet or dry) is being sampled.

Technical discussions dealing with soil characteristics can be found in numerous sources: Soil Survey Staff, 1975; Boul and others, 1973; Buckman and Brady, 1969 and, more specific to the area, U.S.F.S. Region 6 Staff, 1985; and Geist and Strickler, 1978.

Plant Association Concept

"Plant communities" are any grouping of plants that an investigator recognizes as having some structural similarity. As the investigation of the Wallowa-Snake Province has progressed over the years, various plant communities have been encountered that differed in many compositional and/or environmental parameters. The purpose of this classification effort has been to reduce the variation of communities on the various landforms into groupings that could be more easily comprehended. These groupings were identified by using dominant vegetation and considering the environmental conditions which influenced that vegetation to grow in a similar, predictable, and repetitive fashion.

The groupings defined in this publication are termed **"plant associations"**. If a particular stand is able to persist and develop in its environment, and if inter-specific competitive forces remain natural without disturbing influences, then following a long period of time those plants which can reproduce in competition will constitute a long-term stable community or **"climax"** community. This climax plant community containing a definite plant composition, having similar gross appearance or physiognomy, and growing in uniform habitat conditions, is called a plant association. As a combination of similar environmental factors are repeated across a landscape, a predictable plant association will occupy those sites given time and lack of disturbance. The use of the term **"type"** refers to the plant association grouping for readability of the text.

Vegetation of the Wallowa-Snake Province, and the Pacific Northwest in general, has undergone repeated natural and human-caused disturbances. Wildfire, prescribed burns, logging operations, and grazing by wild and domestic animals have all contributed to a potpourri of plant communities in varying stages of succession short of climax. In some cases, plant communities described have had degrading perturbations so severe and frequently that the climax dominant plants no longer remain. This vegetation is called a **"disclimax"**.

In the process of seeking stable sites and old-growth stands, many opportunities became available to sample stands that were intermediate to climax. These stands are termed **"seral"**. Most of the stands depicted in this guide are seral reflecting primarily the influences of fire and grazing. From the standpoint of sampling the variation of plant communities across the landscape in differing stand conditions, successional pathways toward climax were defined by predictable seral stages. In order to comprehend site potential, the concept of seral relationships must be clarified. Therefore, even though successional studies have not been completed in the Wallowa-Snake Province, known successional relationships have been provided to help in determining plant association assignment. Some of these seral stages were so regularly exemplified on the National Forest landscape that they have been included as **"plant community types"** separate from their assigned association. An example is lodgepole pine/grouse huckleberry (PICO/VASC) plant community type representing a seral component of the subalpine fir/grouse huckleberry (ABLA2/VASC) plant association. Other plant community types have been classified based on a lack of information or adequate sample numbers to gain sufficient understanding of their synecological relationships for plant association status. Examples are the curlleaf mountain-mahogany plant community type and grand fir/spiraea plant community type.

Approach to Sampling

During the summers of 1980 through 1985, the Wallowa-Snake Province was reconnaissance sampled. The primary objective of the reconnaissance survey was to gain a familiarity of the landscape and the vegetation existing on this land area. The attempt was to cover the various landforms of the study area with enough plots to portray the variation within and among the various terrestrial plant communities. Reconnaissance work resulted in 1,400 plots established in the steppe and forested vegetation of the 1,313,000-acre area (1 plot per 938 acres). Steppe sampling has provided 729 reconnaissance plots; sampling of forested vegetation has resulted in 676 reconnaissance plots. From the reconnaissance survey data, a preliminary classification was devised based primarily on floristic and environmental similarities and dissimilarities.

Plots were then assigned for more intensive study to sample for productivity data, soils information, and to acquire more detailed plant composition data. These 725 intensive plots now represent permanent ecological monitoring points where the investigator can rephotograph and remeasure site information to assess change in vegetative condition, composition, growth, and successional trend. In addition, reconnaissance plots not intensively sampled are available for photo point comparisons and re-estimation of species composition and abundance.

Field Methods

General Considerations

Selection of plot locations was based on portraying differences within and among plant community types. Site factors varying within a type were examined by locating plots to determine influences based on aspect, slope, landform position, elevation, and substrate. Successional relationships were portrayed by locating some plots in stands with structure and composition not indicative of near climax vegetation. Additionally, plots were paired or clustered to determine certain effects (i.e., aspect, slope, substrate) on vegetative composition and productivity where one or more site factors remained constant (i.e., elevation).

The history of the area has included high fire periodicity and historic and continuing grazing by wild and domestic ungulates to a high level of intensity. Plots were oriented to avoid patches of disturbance as much as possible. Some plots containing weediness were included in the investigation to represent the overall status of the stands, however.

Reconnaissance Survey

A circular plot (72 feet in diameter) was established. Within this area a total species list was derived with canopy coverage estimated to the nearest 5% (except at lower limits where estimates were made to 3% and 1% levels). In forested stands, tree crown canopy coverage was also estimated ocularly. Overstory canopy was separated into classes of dominant-codominant and intermediate-suppressed. Understory canopy classes were (1) poles - 4 to 11" DBH; (2) saplings - one meter tall and less than 4" dbh; and (3) seedlings - less than one meter tall. Additionally, soil surface attributes were estimated between the plant bases in the following categories: mosses, lichens, bare ground, erosion pavement, gravel, rock, and litter.

Photo points were established at each plot for future documentation of vegetative change. Black and white photographs and 35mm color slides, microfilmed plot cards, and the plot locations, which are on the TRI system's vegetation plot location subsystem diazo map, constitute resources for monitoring the plots.

Intensive Survey

Data gathered on intensive sample plots included all that was taken on reconnaissance plots plus measurements of forage and tree productivity, soil characteristics, and other site and stand characteristics. Estimates of understory vegetation cover were made within 40-square foot microplots placed along two 100-foot transects in non-forested communities. Species outside of these microplots, but within the sampled plant community, were also noted. Forage production was measured by a combination of clipping and weighing plants within microplots located on a separate transect.

Measurements of at least three to five codominants and dominants for all tree species included: height, age at breast height, diameter (dbh), sapwood width, and radial growth. Trees measured were not confined by the transect area, but were all within the plant community the plot was designed to sample. Stand basal area and number of trees per acre, by species and by diameter class, were measured using a fixed .05-acre plot in 1980 and 1981 and by a plotless cruise technique from 1982 through 1985.

The transects were photographed with long oblique views from both ends, various short oblique views of microplot areas one-square yard in size, and some vertical views of one-square foot microplots. These contribute to the long-term study opportunities to help determine trend, successional relationships, and to analyze impacts from natural or human-made perturbations (i.e., thinning, timber harvesting, fire, and overgrazing).

Office Methods

Vegetation cover data collected from reconnaissance and intensive plots were evaluated using standard procedures and techniques in the Region 6 Ecological Programs (Volland and Connelly, 1978). Vegetation cover refers to the percent of foliar cover of a species in a plot. Since vegetation layers, tree overstory, tree understory, shrubs, forbs, and grasses were measured independently, total cover can exceed 100%.

Reconnaissance data were used to develop an initial classification from which to plan intensive sampling. Final classifications for forest and steppe types were based on reconnaissance estimates of plant composition and cover. Computer programs were used to develop association tables, similarity indices, and ordinations to aid in classification of plots into associations. Cluster analysis, two-way indicator species analysis, discriminant analysis, and analysis of variance were used to examine and test initial groupings and to regroup plots.

From the intensive data, the following growth indices were determined: (1) site index base 100 for all tree species measured (tables from Silviculture Handbook R-6 No. 7); (2) growth basal area (Hall, 1983); and (3) stand density index (Reineke, 1933). All site index base 50 figures were converted to base 100. Estimates of per-acre cubic foot production were made by combining growth basal

area with site index and by using stand density index as a percentage of normal in combination with species-specific mean annual increment equations (Knapp, 1981). These indices, along with trees per acre and basal area per acre by species, were displayed in association tables. Data from soil pit descriptions were also entered in the computer and displayed in association tables. Mechanical analyses of soil horizon materials and bulk density analyses from a subsample of plots were performed at the soil materials lab on the Wallowa-Whitman National Forest. These data were compiled and reviewed with other soils data to determine soil classification using procedures outlined in Soil Taxonomy, Agricultural Handbook No. 436. Soils classifications, however, did not determine plot placements into plant associations. Detailed analyses of soils data were made to identify characteristics within and between vegetation associations. Soil profiles with consistent features were selected to describe soils deemed typical for a type. Other profiles were used along with landscape and elevation features to describe the variation of soils within a plant association. In some cases, vegetation data from sample plots portraying early seral stands did not lend themselves to classification by standard techniques. Soils data, environmental data, and information from plot notes dealing with adjacent stands were then used to place this plot into the plant association with which it shared the greatest number of similar attributes.

Growth and Yield Indices

Stand density index (SDI) is defined as the number of trees per acre as if average stand diameter (diameter of tree of average basal area) were ten inches. It is used for determining how dense a particular stand is at a particular point in time and can be used to describe the difference in stand density among stands of the same average stand diameter in terms of the number of trees. The development of SDI focused on 14 species in pure, even-aged stands (Reineke, 1933). SDI volume increment is computed by a series of equations which relate the actual production of a sampled stand to the production of a normally stocked stand (Knapp, 1981). This method was initially developed to index annual cubic foot growth potential as a relative means for evaluating commercial or noncommercial status of forest sites.

Growth basal area (GBA) is defined as the basal area at which dominant trees grow one inch in diameter per decade at age 100 (Hall, 1983). It is used for determining site potential limitations on stockability. The concept evolved as a result of an ecological study of pine and fir forests in the Blue Mountains of eastern Oregon (Hall, 1973). Three species in pure, even-aged stands were evaluated in that study: ponderosa pine, Douglas-fir, and lodgepole pine. GBA can be used with site index (SI) to calculate a site productivity index. This GBA volume growth index is computed as SI X GBA X .004 in this publication. Since both SI and GBA are indexed to age 100, the GBA volume growth index is an expression of potential volume growth for even-aged stands at age 100. In the Wallowa-Snake Province, GBA was determined from the following measurements of dominant and codominant trees in various diameter/age conditions: radial increment of the last decade, site index, total tree age, and basal area. Basal area

Sample Size - Not all plots sampled were used to describe and define the plant associations. The number of plots used is provided in parenthesis following the type label (i.e., n = 10). This number may vary on subsequent tabular displays when certain plots were rejected for either production or lower neral status.

Photos - The reference pole in most pictures is one meter tall and segmented into decimeters to facilitate visualizing size of vegetation.

Maps - The map is provided to show the dispersion of those sample plots used in the type description. The map is not reflective of all sample locations nor the total extension of a type within the administrative units.

Environment-Soils Table - The location abbreviations for the administrative units are: ECRD - Eagle Cap Ranger District; HCNRA - Hells Canyon National Recreation Area; LGRD - La Grande Ranger District; PRD - Pine Ranger District; WVRD - Wallowa Valley Ranger District. Root Concentration zone - Root conc.

Table of Principal Species - This table contains only the primary species of a type with which the user should be familiar. The values are ocular estimates of foliar cover in percent using circular plot sizes of 72 feet in diameter in both forested and non-forested communities. Averages in the Table of Principal Species were calculated by dividing the total foliar cover of a species when it occurred by the number of plots containing that species (i.e., average of absolute values). Sizes of soil surface particles are as follows: rock - 3 inches or greater; gravel - less than 3 inches; pavement - less than 3/4 inch and exhibiting an erosive surface.

Coverage is the percentage of foliar occupation within the area sampled by a species. The use of the term coverage in reference to increases or decreases by plant species as a result of improving or degrading conditions refers to an absolute figure where the number of individuals have changed on a fixed unit of area. Relative coverage (the change in abundance of an individual in relation to other individuals in the community) is not always equivalent. Constancy refers to the percentage of frequency of occurrence of a species in the number of samples in which a species occurs of those samples encompassing an association.

Ecological Status - Very few stands were classified as climax communities. Instead, stands are labelled in seral stages defining identifiable plant community groups on a successional pathway leading toward climax. In forested vegetation, a lodgepole pine (grand fir)/twinflower community may be very early seral in character where only doghair stands of lodgepole pine exist, or late seral when grand fir dominates and lodgepole pine is present as decadent standing trees.

In steppe vegetation, ecological status tends to define the retrogression from climax vegetation as caused by overgrazing, fire, and natural causes. The range manager may look at a FEID-AGSP community that is highly degraded with an abundance of balsamroot and determine it to be in FAIR range condition. The plant ecologist could determine that the composition of the same community related to POOR ecologic condition. However, this would be confusing, especially if a wildlife biologist determined that the value of balsamroot to a bighorn sheep population was high and the community rated GOOD on his "goodness" scale. Therefore, these utilitarian ratings are deferred from this publication until

specific forage rating guides can be devised at the conclusion of the Wallowa-Snake Plant Ecological Classification. Stages in retrogression will be used with the retrogressive sequence defined as follows:

Climax - The stable state when species composition and density do not change over time. The dominant species are reproducing.

Late Seral Stage - Climax species are present, but are not at the density or composition levels of the climax community.

Mid Seral Stage - Climax species are present, but are low in density and composition. Invaders to the community are present, but waning. Increasers may be equally abundant with climax vegetation.

Early Seral Stage - Climax species are present, but are in peril of loss to the community. Increasers dominate. Invaders may be a significant part of the community. A disclimax may result if degradation continues.

Very Early Seral Stage - Climax species are either absent or so few as to make natural recolonization very difficult. Increasers and invaders dominate. A disclimax has resulted where only manipulative change can reintroduce climax dominants.

Since climax vegetation was so infrequently found in the reconnaissance survey, the stages used in the guide begin with "late seral" which incorporates any "climax" vegetation encountered.

Key to Steppe Vegetation

1. Shrubs dominant . . . . . See shrublands key (pg. 156)

1. Shrubs absent or present in minor amounts 2

    2. Green fescue (FEVI) with at least 5% cover . . . . . See green fescue series key (pg. 18)

    2. Green fescue absent or cover less than 5% 3

        3. Idaho fescue (FEID) or Kentucky bluegrass (POPR) present and usually abundant . . . . . See Idaho fescue series key (pg. 29)

        3. Idaho fescue and Kentucky bluegrass absent or occurring as infrequent plants only in moist microsites 4

            4. Bluebunch wheatgrass (AGSP) present and usually abundant . . . . . See bluebunch wheatgrass series key (pg. 84)

            4. Bluebunch wheatgrass absent or occurring as infrequent plants only in microsites or bedrock fractures at less than 5% coverage . . . . . See incidental types key (p. 208)

Green Fescue Series

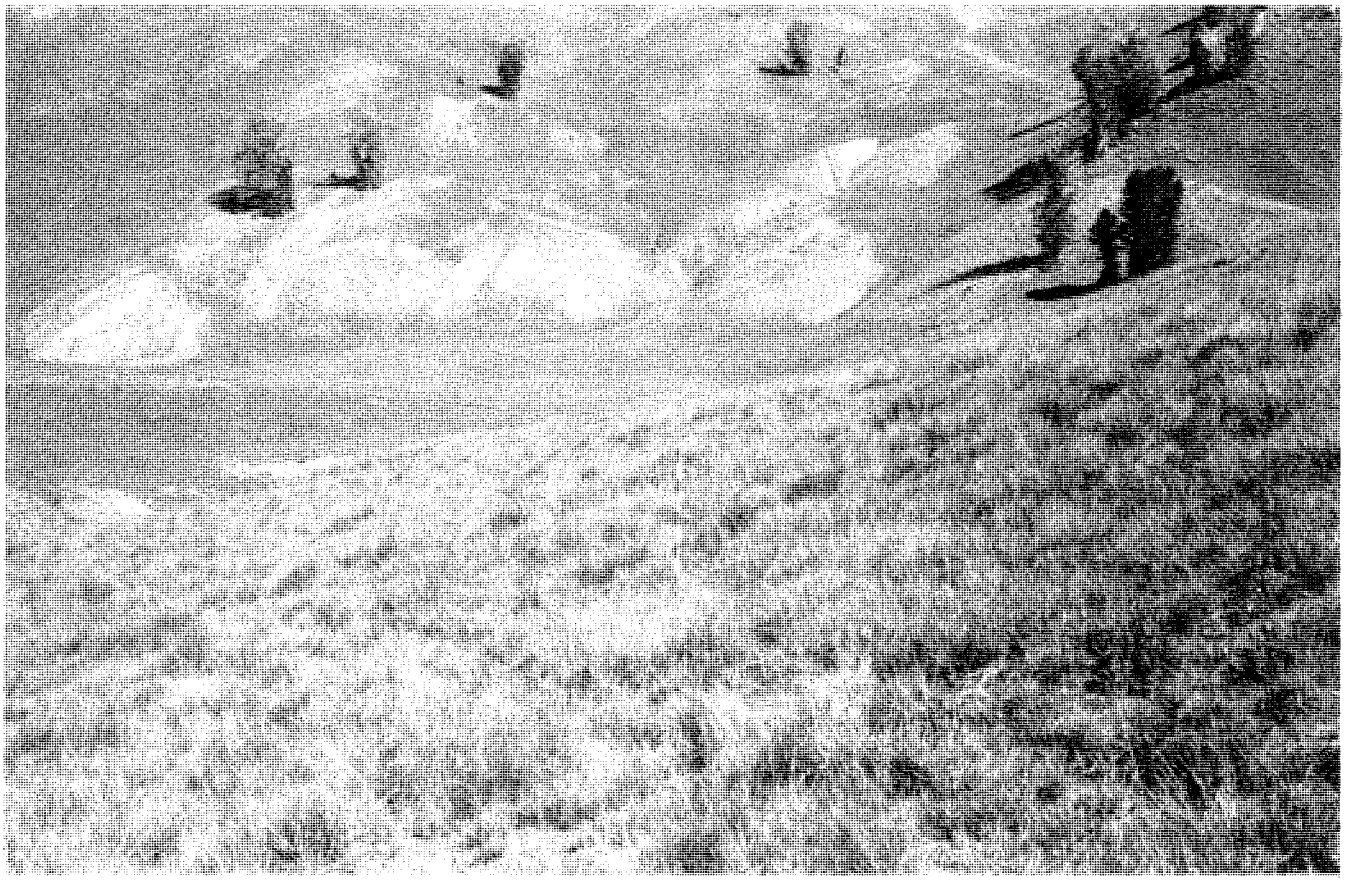
GREEN FESCUE SERIES

Summary of Plant Association and Community Type Characteristics 1/

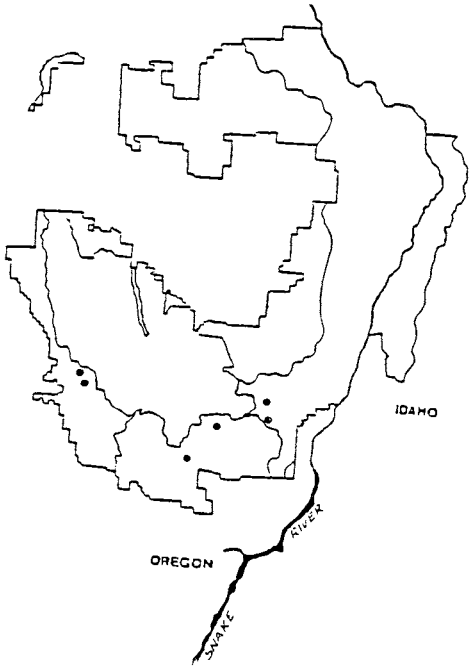
Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	Principal Increasers/ Invaders	(3) Forage (lbs./acre) dry
FEVI-CAHO	5900-7900 (7000)	tops to upper slope	SE-SW	10-30% (20%)	basalt colluvium + loess(ash)	26-28 (27) 19-26 (22)	FEVI,CAHO POCU	STOC,PEGL4/ RUOC,HAJE	(960) 725-1200
FEVI-LULA2	6300-8400 (7460)	tops to lower slope	all	5-65% (33%)	basalt colluvium + loess(ash)	32-50 (41) 20-38 (30)	FEVI,LULA2 STOC	LULA2,ACLA/ ASIN,MAGL	(880) 550-1300

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Forage production in mid and late seral communities

Green fescue-Hood's sedge plant community type
Festuca viridula - Carex hoodii (FEVI-CAHO) (GS11 11)



1. Tenderfoot Basin, N. Fork Imnaha River (Eagle Cap Wilderness Area) *Plot 6084*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: PRD, LGRD	Parent Material: basalt colluvium + loess
Elevation: (7000 ft.) 5900-7900 ft.	Solum depth: (27 in.) 26-28 in.
Aspect: (SW) SE-SW	Loess depth: (18 in.) 15-21 in.
Slope (20%) 10-30%	Root conc: (22 in.) 19-26 in.
Position:(plateau, ridgetop)slopes to plateau tops	Depth to GT 35% rock frag./size: (26 in.)25-27 in./gravels, cobbles
Other: high elevation green fescue communities on moist sites.	Surface soil/subsoil texture: silt loam, silt/silty clay loam, silt loam

Table of Principal Species

FEVI/CAHO (n = 6)

Mean Foliar Cov (%)/Cons (%)

Species	Code	Mid Seral	Early Seral	Total Range
Grasses				
*green fescue	FEVI	21/100	3/100	1-30
*Hood's sedge	CAHO	15/100	17/100	3-30
*Cusick's bluegrass	POCU	2/50	-	0-3
western needlegrass	STOC	9/75	32/100	0-60
Perennial Forbs				
spurred lupine	LULA2	48/50	-	0-55
globe penstemon	PEGL4	10/75	15/50	0-25
western coneflower	RUOC	-	20/50	0-20
blue stickseed	HAJE	-	5/50	0-10
Surface Features				
rock		1/75	-	0-1
gravel		1/25	5/50	0-5
pavement		1/50	-	0-1
bare ground		8/100	23/100	1-25
moss		5/25	-	0-5
litter		4/100	63/100	1-95

Herbage Production (lbs./acre dry wt.

green fescue	270	260-280
sedges	100	70-130
forbs	600	400-800
total	970	725-1200

* Principal Indicator Species

Vegetative Composition - A moist site green fescue community, where Hood's sedge is associated with the fescue, occurs on ridgetops, seepy sideslopes, and in interforest meadows. Hood's sedge has probably increased from lower abundance levels (5% or less) to the coverages found in most stands today (10-20%) as a result of overgrazing of the fescue. No late seral stands were encountered in this type. Mid seral stands are differentiated from early seral stands by higher coverage of fescue, less surface cover of bare ground and gravel, and presence of Cusick's bluegrass (POCU) which appears to be absent from early seral communities. Early seral stage is defined by an overall greater weedy character where western needlegrass (STOC), globe penstemon (PEGA4), western coneflower (RUOC), and blue stickseed (HAJE) may dominate over fescue and sedges. Terracettes covered by forbs adjacent to deflation depressions with erosion pavement and gravels characterize poorer condition FEVI-CAHO rangelands.

Distribution and Environmental Features - FEVI-CAHO communities are fairly common in the high elevation plateaus and ridges from the Imnaha Divide south along the southern flank of the Wallowas. The most extensive stands occur on ridges around Fish Lake, Upper Catherine Creek, and on the divide south of the Imnaha River. Elevations range from 5,900 to 7,900 feet (mean 7,000 feet) and sites are typically plateau or ridgebrows. Slopes range from 10 to 30% (mean 20%). Surface microrelief is convex.

Soils - Soils are formed in weathered basalt and loess, are less than 30 inches deep, and have silt loam textures. Rock fragments are predominantly gravel-sized and account for less than 15% of the soil volume in surface layers. Rock fragments increase in subsoil horizons. Roots are concentrated in the upper loess-rich layers although the rooting zone may be much deeper. The fine textured surface layers are easily eroded if the thick cover of grasses and forbs lose vigor or are removed.

Synecological Relationships - This plant community type is more moist than FEVI/LULA2 as indicated by ranker green fescue, greater number of associated sedges (Hood's, Raynold's, small winged, and thick-headed sedges), and presence of moisture-loving forbs like bistort. These communities are often inclusions in drier FEVI/LULA2 communities on slopes and ridges or may be fairly extensive where cool, moist conditions promote the occurrence by wetter site species.

Role of Fire - Fire has probably not been a major influence on these wetter, high elevation communities. Late summer-early autumn burns would be the most detrimental to maintenance of green fescue in these communities.

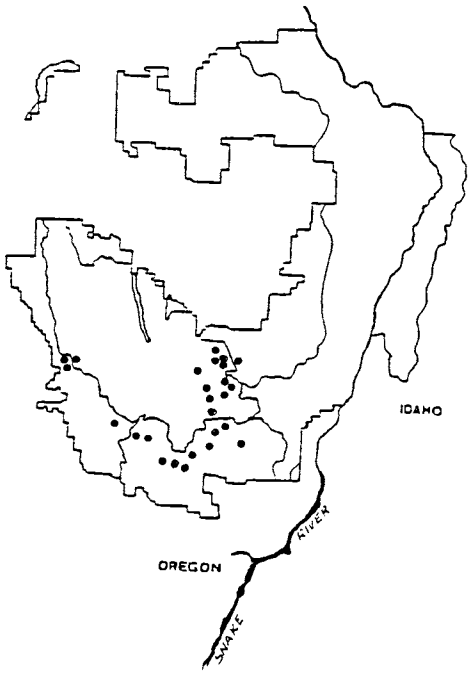
Management Considerations - These sites are highly productive subalpine grasslands that should be managed for promotion of green fescue with minimal forb-sedge composition. Needlegrass is a major increasing species which can provide good early summer feed, but mid summer seedheads are usually avoided by livestock. It remains green in the fall after other plants have dessicated and is then utilized as a species of greater preference. Western coneflower is a very aggressive invader and has remained as the ultimate perennial on many depleted western rangelands. It is only grazed as a last resort.

Comparison With Other Studies - This community has not been previously described.

Productivity - These communities can be highly productive and provide important mid to late season forage. Green fescue, spurred lupine, and Hood's sedge make up most of the palatable herbage produced.

Green fescue/spurred lupine plant association
Festuca viridula/Lupinus laxiflorus (FEVI/LULA2) (GS11 12)

2. Table Mountain (Pine Ranger District) *Plot 1212*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: ECRD, PRD WVRD, LGRD	Parent Material: basalt colluvium + loess
Elevation: (7460 ft.) 6300-8400 ft.	Solum depth: (41 in.) 32-50 in.
Aspect: All	Loess depth: (30 in.) 20-38 in.
Slope (33%) 5-65%	Root conc: (30 in.) 20-38 in.
Position: (ridgetop) ridgetop to lower slope	Depth to GT 35% rock frag./size:surface to 40 in./gravels, cobbles
Other: Often heavily impacted from sheep use at earlier part of century.	Surface soil/subsoil texture: silt loam/loam, sandy clay loam

Table of Principal Species

FEVI/LULA2 (n = 26)

Species	Code	Mean Foliar Cov (%)/Cons (%) Late Seral (n=7)	Mid Seral (n=8)	Early Seral (n=8)	Very Early Seral (n=1)	Late-Mid Seral Range
Grasses						
*green fescue	FEVI	67/100	41/100	24/100	-	25-75
*western needlegrass	STOC	3/86	9/50	7/75	-	0-25
bearded wheatgrass	AGCA	1/29	20/13	5/13	-	0-20
Hood's sedge	CAHO	1/43	1/13	1/25	-	0-1
Ross' sedge	CARO	1/14	1/13	15/50	-	0-1
Perennial Forbs						
*spurred lupine	LULA2	18/57	25/63	38/38	5/100	0-40
tailcup lupine	LUCA	-	20/13	85/13	-	0-20
fleeceflower, pokeweed	POPH	-	9/38	1/25	-	0-20
thick-stemmed aster	ASIN	3/14	3/63	1/13	1/100	0-5
nodding microseris	MINU	3/29	2/38	3/25	-	0-5
yarrow	ACLA	1/57	5/75	17/50	-	0-15
western hawkweed	HIAL2	3/14	2/50	6/38	-	0-3
yellow buckwheat	ERFL	-	3/25	7/50	-	0-5
globe penstemon	PEGL4	-	1/13	1/25	45/100	0-1
Surface Features						
rock		1/43	5/63	7/75	1/100	0-20
gravel		3/100	5/88	7/63	1/100	0-20
pavement		3/29	18/50	-	-	0-20
bare ground		12/100	11/100	26/100	3/100	5-25
moss		-	3/38	10/13	35/100	0-5
litter		31/100	32/100	24/100	1/100	1-85
Herbage Production						
green fescue		510				400-600
other grasses		250				70-700
forbs		110				25-175
Total		870				640-1340

* Principal Indicator Species

Vegetative Composition - Green fescue communities at high elevations in the Wallowa Mountains represent a cold, moist climate where green fescue is more adapted than Idaho fescue. In late seral stands, green fescue forms dense mats with relatively few breaks in the continuous sod. If pristine stands were available, a basically forb-free grassland would be achievable. The degrading of these communities by domestic sheep, wild ungulates, and harsh natural forces has resulted in the fescue mats being broken into a hummocky character with deflation depressions created by wind and surface water erosion. Late seral stands usually contain western needlegrass and may have a heavy cover of spurred lupine and yarrow. Bare ground may be prominent (up to 20%) between vegetated patches. Mid seral stands are notable for having increased bare ground and gravel (up to 40%) with resultant decreases in green fescue. Lupine continues to be the primary increasing forb and the only one of prominence. Fleeceflower (POPH), thick-stemmed aster (ASIN), and yarrow (ACLA) are also prominent in mid seral communities. Early seral stands have high rock/bare ground exposure, decreased fescue and prominent weedy patches of yellow buckwheat (ERFL), yarrow, and a general increase by western needlegrass throughout the green fescue sward. The depressions are thinner soil sites where pioneering species are found; i.e., phlox, pussytoes, spraguea, buckwheats, knotweeds, and Ross' sedge. Very early seral stands are usually devoid of sedge-grass cover and have become forbfields dominated by globe penstemon, fleeceflower, pussytoes, buckwheats, or are void of perennial vegetation entirely.

Distribution and Environmental Features - These communities occur on high elevation basalt ridges fringing the Wallowa Granitic Uplift. The green fescue/spurred lupine communities can be found from Wing Ridge southward along the east flank to the Imnaha Divide; across the southern flank at the upper extremities of Pine Ranger District from Russel Mountain, Lake Fork Basin, Bennett Peak to the head of Catherine Creek on the southwest side of the Wallowa Mountains. They are among the highest elevation grassland communities in the province. Elevations range from 6,300 to 8,400 feet (mean = 7,500 ft). Sites are typically along ridges or on the upper 1/3 of steep slopes, but occasionally extend to mid and lower slopes in high elevation basin areas. On gentle-sloping ridge summits and ridge brows the type may be associated with whitebark pine communities. Surface microrelief is convex to smooth or slightly undulating; all aspects may be represented.

Soils - Soils are typically dark reddish brown in color in surface layers, greater than 32 inches in depth, and formed in basalt colluvium, loess, and ash. Surface layers have silt loam textures and less than 35% rock fragments by volume. Soils in ridge areas commonly have less than 15% rock fragments in surface layers. These fine-textured soils are easily eroded and whole sections of sod may move downslope from slumping giving the communities a patchy appearance. Subsoil layers have very fine sandy loam to loam textures and less than 35% rock fragments. Gravel to cobble-sized rock fragments are predominant throughout the soil layers. Surface rock seldom exceeds 30% cover. Rock fragments may occasionally exceed 35% by volume in deep colluvial areas in lower slope positions. Clay concentrations were not observed in any sample pits.

Synecological Relationships - Some steep, seepy sites occur as inclusions in this type where cool, wet-loving plants are associated with the green fescue. Some of these indicators are Holm's Rocky Mountain sedge (CASC5), Canby's lovage (LICA2), Cusick's bluegrass (POCU), skyline bluegrass (POEP), and silky phacelia (PHSE). Green fescue achieves its rankest, most luxurient growth on these highly productive microsites.

The secondary successional relationships of vegetation in green fescue communities is well documented in pioneering investigations conducted by Arthur W. Sampson between 1907 and 1911 on the Standley Allotment in the Wallowa Mountains. Then in the 1940's, E. H. Reid and G. D. Pickford continued to produce fundamental standards to assess the direction of succession and to rate condition on these subalpine grasslands (Reid - 1941; Pickford and Reid - 1942; Reid and Pickford - 1946). Reid continued his studies in Tenderfoot Basin through retirement and was able to show photographic evidence of vegetative change using comparative camera points through a time sequence (Reid, Strickler, Hall - 1980). Similar comparative photography was utilized to document change from Sampson's earlier photographic work at Standley (Strickler, Hall - 1980). Parker 3-Step C&T clusters established for 20-25 years have also proven valuable in assessment of successional dynamics.

A climax green fescue subalpine grassland would include a nearly forb-free continuous sod mat of this bunchgrass with interspaces consisting of litter in the virtual absence of bare ground, erosion pavement, or gravel and rock particles. The effects of overgrazing results in the exposure of bare ground which then is removed by accelerated surface wind and water erosion. Deteriorated green fescue communities are characterized by a distinctive hummocky appearance with deflation depressions containing an erosion pavement. Weedy forbs, needlegrasses, or Ross' sedge increase with disturbance. In depleted green fescue rangelands, where the continuous grass sod and surface soil has been broken, soil loss can be rapid. The melting of high elevation snowfields, provides an abundant source of melt water capable of creating severe gully erosion on sod-less slopes.

Plots were paired on Meadow Mountain above and below a major submerged flow which influences the water availability of both sites. Spurred lupine is virtually absent on the droughtier site, but present at high coverage (40%) with green fescue and rank western needlegrass on the moister site. Green fescue is dominated by a more diminutive western needlegrass on the droughty slope. Grazing pressure, soil depth, aspect, slope percentage and elevation are all constant variables between the two sites. This comparison indicates a preference by the lupine for more mesic sites and a tenacity by needlegrass to persist on the drier slopes of FEVI/LULA2.

Role of Fire - The effects of burning green fescue rangelands are not documented. It is probable that fire would create greatest damage to green fescue in late season when plant moisture contents are lowest. The weedier forbs (yarrow, aster, penstemon, pokeweed) would be favored. Caution should be used to avoid removing the protective plant cover and litter on these sites where erosion potential is typically high.

Management Considerations - Green fescue communities occur in exposed areas where yearly snow cover due to drifting and wind transfer is less than in adjacent forest stands. These are droughty, late summer ranges with a high wind and water erosion potential. The utilization of green fescue should be no

greater than 50% in order to maintain sufficient seed stalks for natural reproduction and continued upward trend of deteriorated rangelands. This should require a minimal stubble height of 3 inches (Pickford and Reid - 1942). Proper grazing by domestic sheep should promote fescue, retard forbfields, and promote grass seed establishment. Cattle and heavy concentrations by elk can create severe erosive opportunities through displacement of fescue mats and dry summer soils. The fine textured rock free surface soils may be rapidly eroded by intense summer storms. Green fescue rangeland should not be considered as primary range for heavy ungulates.

Spurred lupine when ingested in large quantities over a brief time span can cause colic in horses, nervousness and excitability in sheep, and muscular trembling and prostration in cattle. The mature fruits are especially toxic to cattle (Kingsbury 1964).

Productivity - Total forage production is high in these communities and comparable to other upper elevation green fescue and Idaho fescue types. In mid and late seral communities, production is primarily by grasses. As grass competition is reduced, forbs, notably lupines, may increase and a more diverse forage may be available.

Comparison With Other Studies - Green fescue occurs in the Cascade Mountains of Oregon and Washington, the Rocky Mountains of Canada and northern Idaho, and is present in subalpine clearings and on montane slopes in the Wallowa Mountains. Henderson (1973) defined three communities in the subalpine of Mt. Rainier: (1) a moist site type with green fescue and Lupinus latifolius domination; (2) a dry site type with Aster ledophyllus dominating with green fescue; and (3) a lower elevation site community containing Potentilla flabellifolia with the fescue. The green fescue communities of the Wallowas have not been previously classified into plant associations. Pickford and Reid (1942) defined stages of retrogression from "climax" to a "second weed stage". Reid, Strickler, and Hall (1980) have also documented successional change and relationships in the green fescue zone. Cole (1977) included a discussion of the green fescue community in his Eagle Cap Wilderness recreational impact study.

"Experience is the father of wisdom"
Vogl

Idaho Fescue Series

1a. Sedges present throughout community with at least 5% cover. . 2

2a. Elk sedge (CAGE) associated with Idaho fescue on steep mountain side-slopes as inter-forested clearings . . . . . FEID-CAGE (p. 83)

2b. Elk sedge absent or occurring in minor amounts 3

3a. Timber oatgrass (DAIN) occurs at 10% or greater coverage with Idaho fescue. Liddon's sedge (CAPE), pussytoes, and capitate sandwort are usually associated. . . . . FEID-DAIN-CAREX (p. 79)

3b. Hood's sedge is the dominant sedge associated with Idaho fescue. Liddon's sedge, capitate sandwort, and timber oatgrass absent. . . . . FEID-CAHO (p. 80)

1b. Sedges absent or present at less than 5% cover 4

4a. Idaho fescue or Kentucky bluegrass well represented and usually dominant. A union of mesic plant species are usually present consisting of all or many of the following: prairie junegrass (KOCR), red avens (GETR), western hawkweed (HIAL2), field chickweed (CEAR), cinquefoils (POGR, POGL), Missouri goldenrod (SOMI), red besseya (BERU), and twin arnica (ARSO). Coarse fragments (rock, gravel, and erosion pavement) generally cover less than 20% of the soil surface 5

5a. Ridgetop or ridgebrow locations 6

6a. Meadows rich in forbs with California oatgrass, timothy, and Kentucky bluegrass commonly associated . . . . Kentucky bluegrass meadows (p. 223)

6b. Grasslands devoid of California oatgrass or timothy 7

7a. Bunchgrasses (FEID, AGSP, KOCR) occupy distinct mounded structures (at least 24 inches high) separated by swales or scab-land mosaic. Forbs usually associated are red besseya (BERU), woodrush pussytoes (ANLU), and red avens (GETR) . . . . . FEID-KOCR mounds (p. 38)

7b. Bunchgrasses (FEID, KOCR, AGSP) occupy continuous topography or patterned ground less than 24 inches in height. Scablands may be associated, but only as minor inclusions. Sandberg's bluegrass and one-spike oatgrass often associated with the following perennial forbs: Missouri golden-rod (SOME), thin-leaved owl clover (ORTE), shaggy daisy (ERPU)
. . . . . FEID-KOCR ridgetops (p. 33)

5b. Locations between ridgetop and footslope usually on steep slopes (greater than 25%). Snake River bench is included 8

8a. Benchlands (usually less than 25% slope) dominated by Kentucky bluegrass, rhizomatous bluebunch wheatgrass, annual bromes, red three awn, annual fescues, and goatweed from severe disturbance . .
Snake River Degenerated Bench p.c.t. (p. 50)

8b. Slopes usually greater than 25% 9

9a. Substrates generally on Yakima basalt flows. Wyeth's buckwheat (ERHE), meadow death camas (ZIVEG), and red avens (GETR) usually associated with the bunchgrasses . . . . . FEID-KOCR (High elevation) (p. 44)

9b. Substrates generally on Imnaha basalt flows or pre-Tertiary rock. Wyeth's buckwheat (ERHE) and red avens (GETR) absent. Snake River phlox (PHCO2) usually associated . .
FEID-KOCR (Low elevation) (p. 51)

4b. Idaho fescue is subordinate or co-dominant with bluebunch wheatgrass. The union of mesic plant species listed in 4a. are rare and infrequent. Coarse fragments (rock, gravel, and erosion pavement) generally cover greater than 20% of the soil surface 10

10a. Ridgetops and adjacent gentle slopes (less than 20%). Hoary balsamroot (BAIN), woodrush pussytoes (ANLU), dwarf yellow fleabane (ERCH), stonecrop (SELA2), and onespike oatgrass (DAUN) usually occur with the fescue and bluebunch wheatgrass
. . . . . FEID-AGSP Ridgetops (p. 58)

10b. Slopes greater than 20% with scabland plants absent 11

11a. Wyeth's buckwheat (ERHE) absent; Snake River phlox (PHCO2) and shaggy fleabane (ERPU) present . . . . . FEID-AGSP/PHCO2 (p. 74)

11b. Wyeth's buckwheat present or Snake River phlox and shaggy fleabane absent 12

12a. Bunchgrass communities containing a mesic group of associated forbs. These include agoseris (AGOSE), field chickweed (CEAR), white stemmed frasera (FRAL2), wayside gromwell (LIRU), and hawkweed (CRAC). Silky lupine composition is usually greater than 5% cover. Speedwell is a prevalent annual . . . . . FEID-AGSP/LUSE (p. 63)

12b. Bunchgrass communities containing a more xeric group of associated forbs with the bunchgrasses. These include hot rock penstemon (PEDE), eriophyllum (ERLA), and swale desert parsley (LOAM). Silky lupine composition is usually less than 5% cover. Speedwell is usually absent. . . . . FEID-AGSP/BASA (p. 69)

IDAHO FESCUE (FEID) SERIES

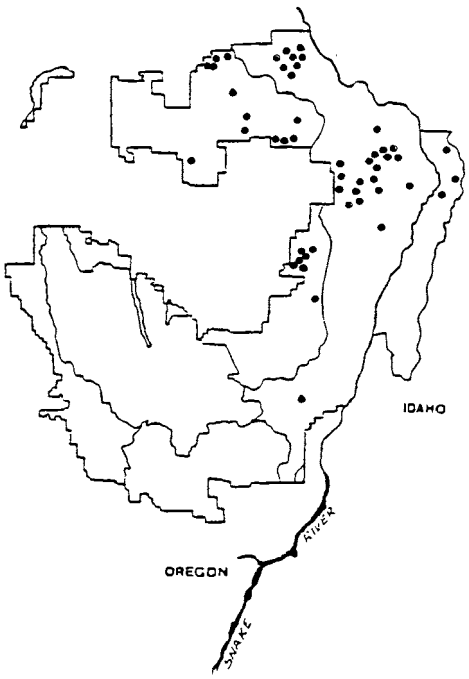
Summary of Plant Association and Community Type Characteristics 1/

Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	Increasers/ Invaders	(3) Forage (lbs./acre) dry
FEID-KOCR ridgetops	3800-6500 (4900)	tops to upper slope	all	1-25% (10%)	Loess + basalt	12-30 (20) 8-14 (10)	FEID,KOCR ARSO,GETR	ERHE,POPR/ GRNA,TAOF	(1080) 640-1730
FEID-KOCR mounds	4000-5900 (4700)	tops	all	2-11% (4%)	Loess + basalt	28-35 (32) 15-31 (27)	FEID,KOCR GETR,BERU	ERHE,POPR/ MAGL,GRNA	(1200) 980-2400
FEID-KOCR high	3800-6600 (4800)	mid to upper slope	NE-W	30-75% (50%)	Loess + basalt colluvium	24-60 (48) 12-30 (20)	FEID,KOCR FRAL2,HIAL2	BASA,LUSE/ HYPE	(850) 530-1800
FEID-KOCR low	1200-3850 (2600)	lower to upper slope	NE-NW	35-90% (61%)	Loess + colluvium various	51-80 (70) 22-40 (30)	FEID,KOCR PHCO2,FRAL2	AGSP,ARSO/ GAAP,FEME	(990) 450-1700
FEID-AGSP ridgetops	4000-6000 (4750)	tops to upper slope	all	2-18% (7%)	basalt basalt	5-14 (10) 6-9 (7)	FEID,AGSP SELA2,BAIN	POSA3,AGSP/ PODO,ANLU	(360) 260-500
FEID-AGSP/ LUSE	4000-5800 (4900)	mid to upper slope	SSE-W	30-78% (50%)	colluvium + loess	16-28 (23) 13-28 (21)	FEID,AGSP LUSE,CRAC	BASA,LUSE/ CLPU,BLSC	(805) 470-1040
FEID-AGSP/ BASA	3800-6000 (4550)	mid to upper slopes	E-SW	21-70% (50%)	basalt (loess)	9-27 (17) 9-27 (16)	FEID,AGSP BASA,LOAM	BASA,ACMIL/ PODO,BRBR	(675) 390-1000
FEID-AGSP/ PHCO2	2200-3700 (3000)	lower to upper slopes	E+W	55-70% (63%)	basalt granodiorite	20-22 (21) 6-16 (11)	FEID,AGSP PHCO2,ERPU	LUSE,BASA/ ANNUAL BROMES	(670) 600-750
FEID-DAIN-CAREX	6300-7900 (7200)	tops to upper slopes	W-NW	6-50% (20%)	loess + various geol.	24-60 (38) 6-24 (16)	FEID,DAIN CAPE	CAHO,ACMIL/ STOC,POPR	(800) 600-1000
FEID-CAHO	6000-8000 (6600)	tops to upper slopes	SW	3-55% (15%)	Loess + basalt, granodiorite	35-60 (45) 18-22 (20)	FEID,CAHO	BRCA,ASIN/ AGGL,MAGL	(670) 480-850

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Forage production in mid and late seral communities

Idaho fescue - prairie junegrass (ridgetops) plant association
Festuca idahoensis - Koeleria cristata
(FEID-KOCR) (ridgetops) (GB59 11)

3. Grizzley Ridge (Hells Canyon NRA) *Plot 486*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: loess + basalt colluvium
Elevation: (5200 ft.) 3800-6500 ft.	Solum depth: (20 in.) 12-30 in.
Aspect: all	Loess depth: (8 in.) 4-14 in.
Slope (10%) 1-25%	Root conc: (10 in.) 8-14 in.
Position: ridge and plateau tops, brows	Depth to GT 35% rock frag./size: (10 in.) 4-18 in./ cobbles, grav., stones.
Other: may occur on slightly patterned ground	Surface soil/subsoil texture: silt loam, loam/ silty clay loam,clay loam clay

Table of Principal Species

FEID-KOCR (ridgetops) (n = 50)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=6)	Mid Seral (n=22)	Early Seral (n=11)	Very Early Seral (n=11)	Late-Mid Seral Range
Shrubs						
Wyeth's buckwheat	ERHE	4/50	3/55	10/64	3/64	0-10
Grasses						
*Idaho fescue	FEID	43/100	23/100	13/100	1/45	10-60
*prairie junegrass	KOCR	2/100	3/91	5/100	9/36	0-15
*bluebunch wheatgrass	AGSP	11/83	16/91	19/82	17/45	0-40
Kentucky bluegrass	POPR	1/33	11/41	8/55	46/64	0-25
*Sandberg's bluegrass	POSA3	1/33	8/64	10/73	9/27	0-25
onespike oatgrass	DAUN	6/50	5/14	1/9	65/18	0-15
soft chess	BRMO	-	2/32	2/45	8/18	0-5
cheatgrass	BRTE	1/17	3/32	9/45	-	0-5
rattlesnake brome	BRBR	1/17	2/14	2/27	1/18	0-3
Perennial Forbs						
*twin arnica	ARSO	9/50	8/64	11/73	3/45	0-25
*red avens	GETR	6/67	4/32	10/64	10/45	0-15
slender cinquefoil	POGR	5/17	3/27	6/45	10/73	0-10
red besseya	BERU	1/17	2/36	3/36	4/18	0-5
western hawkweed	HIAL2	1/50	2/32	1/18	1/9	0-3
meadow death camas	ZIVEG	3/33	2/45	2/45	-	0-5
long-leaved hawksbeard	CRAC	1/33	1/9	1/27	1/9	0-2
small-leaved fringecup	LIPA	1/17	2/36	6/27	1/18	0-3
agoseris spp.	AGOSE	-	3/36	2/45	3/36	0-10
yarrow	ACMIL	4/100	5/100	7/100	6/100	0-15
shaggy fleabane	ERPU	1/17	2/23	1/45	10/9	0-5
lupines	LUSE/LUCA	15/33	9/90	13/73	3/36	0-30
thin-leaved owl-clover	ORTE	6/33	2/36	1/36	1/9	0-10
low gumweed	GRNA	1/17	4/18	2/27	-	0-5
common dandelion	TAOF	1/33	3/32	1/18	2/27	0-10
yellow salsify	TRDU	1/50	1/55	1/55	1/27	0-3
field chickweed	CEAR	20/17	8/18	12/27	2/27	0-20
woodrush pussytoes	ANLU	-	1/23	3/36	14/36	0-1
Annual Forbs						
narrow leaved collomia	COLI2	1/17	1/41	2/45	1/45	0-1
speedwells	VERE,VEPE	1/33	6/32	2/27	3/27	0-15
Douglas' knotweed	PODO	2/33	1/14	5/9	5/36	0-3
pale alyssum	ALAL	1/17	2/36	8/36	-	0-3
cluster tarweed	MAGL	1/17	4/23	14/27	2/36	0-10
tall annual willowweed	EPPA	1/33	1/14	2/36	1/27	0-1
deer horn	CLPU	1/33	2/23	1/9	2/27	0-5
rock		4/50	8/64	6/45	10/55	0-40
gravel pavement		40/17	11/36	1/27	13/27	0-40
bare ground		13/100	10/95	13/91	13/73	0-40
moss		28/100	18/77	12/45	29/45	0-60
litter		21/100	35/100	32/91	34/100	1-80

Herbage Production (lbs/Acre, dry wt.)

bluebunch wheatgrass	280	330	250	0-990
Idaho fescue	870	390	10	100-1230
other spp	180	210	400	40-200
Kentucky bluegrass	0	30	240	0-170
Total	1,33	960	900	640-1730

* Principal Indicator Species

Vegetative Composition - This type characterizes the common ridgetop grassland communities of the dissected basalt plateau. In the late seral stage, Idaho fescue dominates the ridgetops and ridgebrows comprising the FEID-KOCR (ridgetops) plant association. Prairie junegrass (KOCR) and bluebunch wheatgrass (AGSP) are the most commonly associated grasses. Wyeth's buckwheat (ERHE) and Kentucky bluegrass (POPR) are generally present in small amounts. Perennial forbs often found in late seral communities are yarrow (ACMIL), red avens (GETR), western hawkweed (HIAL2), yellow salsify (TRDU), and twin arnica (ARSO). Bluebunch wheatgrass tends to be rhizomatous in this type. As sites are overgrazed, Idaho fescue is the most sensitive species and declines significantly. Increasers in the type are Wyeth's buckwheat, Kentucky bluegrass, twin arnica, and yarrow. Prairie junegrass, and Sandberg's bluegrass (POSA3) also tend to increase with disturbance as does silky lupine (LUSE). Low gumweed (GRNA) and common dandelion (TAOF) invade on these sites in early seral communities. Ridgetops with severe past sheep abuse often contain extensive stands of gumweed. Annuals that commonly increase with disturbance in this type are common speedwell (VEAR), Douglas' knotweed (PODO), and pale alyssum (ALAL).

Annual bromes all tend to increase, especially cheatgrass (BRTE). Very early seral communities on thin soils resulting from past overgrazing often contain notable amounts of onespike oatgrass (DAUN), woodrush pussytoes (ANLU), stonecrop (SELA2), and other common scabland associates.

Distribution and Environmental Features - FEID-KOCR ridgetop communities occur throughout the bunchgrass zone on all major ridges of the province. Ridgetop summits with and without patterned ground, as well as sloping ridges and ridgebrows, may be dominated by this community. Elevations range from 3,800 to 6,500 feet (mean: 5,200 feet). Slopes are gentle, usually less than 10% on summit areas and up to 25% on sloping ridges and ridge-brow positions. Surface microrelief is variable due to the slightly undulating surface typical of ridgetops.

Soils - Soils are very dark brown to black in color in upper surface layers, less than 30 inches in depth, and formed in loess and basalt colluvium as well as basalt bedrock. Surface soil layers are often thin (8 to 12 in.) and have silt loam or loam textures with less than 35%, and often less than 15% rock fragments by volume. Rock fragments increase in subsoil layers to greater than 35% by volume. Distinct clay concentrations are present especially in rock material at the bedrock contact and in bedrock fractures. Rooting depth may be considerably greater than the solum depth indicates because of moisture availability in the bedrock fractures. Rock fragments range from gravel to stone-sized particles. Surface rock is seldom greater than 15% of total cover except near bedrock outcrop areas.

Soil variability follows changes in slope position and proximity to bedrock. Rockier and shallower soils are more common on narrow ridges (less than 100 ft. in width) and ridge-brow positions where bedrock exposure is more likely. Soils greater than 20 inches in depth are more typical on broad ridges and gently mounded areas that are either transitional to distinct mounds or represent partially eroded mounds.

Summary of Soil and Site Characteristics (all samples) - FEID-KOCR ridgetops

Total Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
11 in. to 40 in.	8 in. to 26 in.	0 to 16 in.	8 in. to 18 in.	Stable	___	0 to 29 in.	0 to 30%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - An example of succession following different degrees of grazing impact is worth noting. The Grizzly Ridge three-way exclosure defines this type in the late seral stage (stock exclosure), and the mid seral stage (game exclosure). The exclosures were established in 1967 on a FEID-KOCR (ridgetop) site having fairly homogeneous vegetation composition. The very early seral stage (outside fenced exclosures) was observed to the north on a similar site, but with a history of more intensive grazing. The successional change resulting from exclusion of all ungulates (game exclosure), domestic stock (stock exclosure), and an area where grazing animals tended to congregate is summarized below following vegetation measurement in 1981:

	Mean Foliar Coverage (%)		
	Stock Excl. Late Seral	Game Excl. Mid Seral	Open Area V.Early Seral
Idaho fescue	42	15	0
prairie junegrass	2	1	0
Sandberg's bluegrass	1	2	5
bluebunch wheatgrass	10	11	0
onespike oatgrass	2	11	28
rock	1	10	11

The dramatic increase in coverage by onespike oatgrass resulted from aggressive competition to fill vacated growing spaces following the loss of Idaho fescue, bluebunch wheatgrass, and prairie junegrass. Notice that Sandberg's bluegrass increases on these gentle ridgetops with disturbance. The stock exclosure contains a higher cover of fescue than the ungrazed area in the game exclosure as a probable result of vegetative stimulation from wild ungulate grazing promoting the tillering of grass shoots.

Series Relationship - These communities are often surrounded by other gentle ridgetop steppe types (i.e., FEID-CAHO, FEID-KOCR mounds, ERDO/POSA3, FEID-AGSP (ridgetop), POSA3-DAUN, ARTRV/FEID, etc.). FEID-KOCR (high) and FEID-AGSP plant associations are often located on slopes below the ridge tops and ridgebrows.

In comparison to other FEID-KOCR types in late and mid seral stages, the FEID-KOCR (ridgetop) type has the greatest abundance of Sandberg's bluegrass and onespike oatgrass reflecting the trafficking by ungulates and shallower soils often found in this type. The type is unique in having low gumweed (GRNA) as an invader.

Role of Fire - Hot burns in the dry summer or fall period will damage Idaho fescue and bluebunch wheatgrass. Kentucky bluegrass may invade or increase following hot fires due to its rhizomatous nature. Gumweed flats may be good candidates for use of prescribed fire although fuels may be lacking for carrying an efficient burn. Junegrass is one of the most fire-resistant perennial bunchgrasses (Britton and Sneva - 1977) and tends to increase on areas following burning (Blaisdell - 1953). The best time for burning Idaho fescue communities is in the dormant season (November-March) when plant moisture is high and damage to root crowns is least likely to occur.

Management Considerations - The ridges, where this type commonly occurs, may be some of the most heavily grazed rangeland in the Wallowa-Snake steppe. The topography is gently rolling, soils are usually deep, and forage can be lush. Elk currently graze Idaho fescue and bluebunch wheatgrass to moderate levels prior to shoot elongation and flowering periods on most ridgetops. Therefore, in order to maintain continued plant vigor, it is imperative that domestic ungulates not be permitted to utilize these sites until following seed maturity. Sites where these two decreasers are unable to provide an adequate seed source can be re-seeded using mechanized equipment in many cases. Areas where Kentucky bluegrass has invaded and dominate the site should not be reseeded to native grasses due to the difficulty of establishment and competive vigor of the bluegrass.

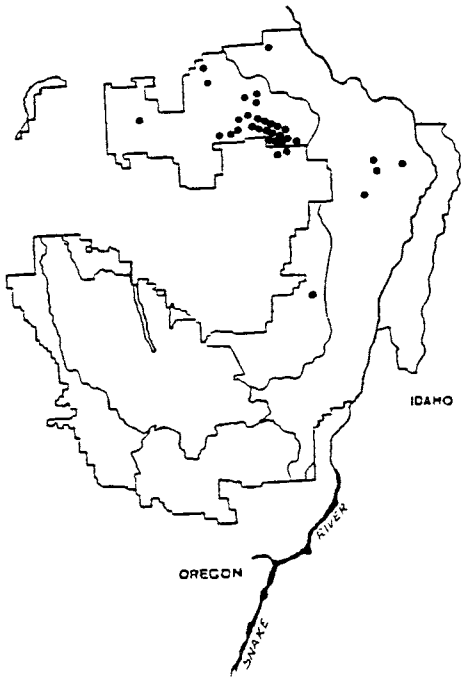
Kentucky bluegrass thrives best on well-drained loams or clay loams of these ridgetops. The plant is especially resistant to close utilization and trafficking by large herbivores. It is rated as very good for cattle and horses, good for sheep and elk, and is one of the better grasses for foraging deer (Range Plant Handbook-1937).

Productivity - Total biomass production in late seral communities is high and exceeds that found in all other upland steppe communities except FEID-KOCR mounds. A good mixture of Idaho fescue, bluebunch wheatgrass, and forbs can be available in these communities as a reflection of continuous animal use which has often resulted in forb increasers. Production of Idaho fescue is greater in only two other types, FEID-KOCR mounds and FEID-KOCR (low). Within the type, Idaho fescue production will decrease substantially in lower successional stages, while bluebunch wheatgrass production remains about the same. Total production in mid and early seral stages is nearly equal, because Kentucky bluegrass and forbs tend to compensate for loss of fescue. Late seral communities produce approximately 40% more forage due primarily to higher fescue production.

Comparison With Other Studies - The FEID-KOCR association was first described by C. E. Poulton (1955) on the Deschutes-Umatilla Plateau of north central Oregon. Campbell (1962) recognized this type between 3,000 and 4,000 feet elevation in the Snake and Salmon Rivers of Idaho. His observation of Spiraea corymbosa with 75% frequency in sample plots indicates a significant difference from this Wallowa-Snake plant association. Tisdale (1979, 1986) working in the Snake River Canyon of Idaho has also described this plant association. He did not segregate it by topo-edaphic features, however.

Idaho fescue - prairie junegrass (mounds) plant association
Festuca idahoensis - Koeleria cristata
(FEID-KOCR) (mounds) (GB59 12)

4. Vance Knoll (Wallowa Valley Ranger District) ***Plot 171***



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA,WVRD	Parent Material: loess, basalt
Elevation: (4700 ft.) 4000-5900 ft.	Solum depth: (32 in.) 28-35 in.
Aspect: all	Loess depth: (11 in.) 6-19 in.
Slope (4%) 2-11%	Root conc: (27 in.) 15-37 in.
Position: ridge and plateau tops	Depth to GT 35% rock frag./size: (32 in.) 28-35 in./ gravels
Other: strongly mounded topography forms mosaic with scablands.	Surface soil/subsoil texture: silt loam/silt loam and loam

Table of Principal Species

FEID-KOCR (mounds) (n =34)

Species	Code	Late Seral (n=3)	Mid Seral (n=10)	Early Seral (n=1)	V.Early Seral (n=3)	POPR Discl. (n=10)	ERHE Discl. (n=7)	Late-Mid Seral Range Range
		Mean Foliar Cov (%)/Cons %						
Shrubs								
Wyeth's buckwheat	ERHE	2/67	7/80	-	-	16/70	40/100	0-35
Grasses								
*Idaho fescue	FEID	38/100	38/100	5/100	3/33	2/40		15-85
*prairie junegrass	KOCR	4/100	6/80	10/100	3/67	7/80	3/57	0-15
*bluebunch wheatgrass	AGSP	10/100	11/70	35/100	15/33	4/40	1/14	0-25
*Kentucky bluegrass	POPR	1/67	9/70	-	3/33	36/100	14/71	0-25
Sandberg's bluegrass	POSA3	3/33	10/50	1/100	15/100	6/60	7/57	0-20
mountain brome	BRCA	-	7/50	-	-		3/43	0-20
soft chess	BRMO	3/33	17/20	1/100	2/100	7/90	10/100	0-30
cheatgrass	BRTE	1/33	9/30	5/100	44/67	8/20	15/71	0-20
rattlesnake brome	BRBR	-	3/20	5/100	1/67	1/30	2/86	0-5
Perennial Forbs								
yarrow	ACMIL	3/100	9/100	-	27/100	17/100	11/86	1-20
*red avens	GETR	5/33	14/70	5/100	3/33	4/60	2/43	0-40
*twin arnica	ARSO	6/67	13/60	1/100	8/67	1/20	1/29	0-20
*red besseya	BERU	1/33	1/60	-	-	1/20	1/29	0-3
*slender cinquefoil	POGR	3/33	3/50	-	15/33	9/40	1/14	0-5
thin-leaved owl-clover	ORTE	1/33	1/40	-	3/33	-	-	0-1
yellow salsify	TRDU	2/67	1/50	1/100	1/100	1/100	1/57	0-3
field chickweed	CEAR	20/33	6/40	-	-	-	-	0-20
woodrush pussytoes	ANLU	-	1/40	1/100	1/33	4/20	2/71	0-1
low gumweed	GRNA	1/33	-	-	1/33	7/40	-	0-1
lupine	LUPIN	3/33	2/60	-	15/33	2/40	1/29	0-3
shaggy fleabane	ERPU	3/33	2/30	1/100	1/33	3/80	6/29	0-3
swale desert-parsley	LOAM	-	-	-	1/33	1/10	8/86	-
Annuals								
blepharipappus	BLSC	3/33	-	-	1/33	1/10	2/29	0-3
narrow leaved collomia	COLI2	2/67	3/40	1/100	2/67	2/90	1/86	0-10
purslane	VEPE	2/67	1/20	3/100	7/100	1/50	2/29	0-3
Douglas' knotweed	PODO	-	-	1/100	1/67	1/20	1/29	(-)
*cluster tarweed	MAGL	-	7/50	1/100	1/67	4/90	14/100	0-30
deerhorn	CLPU	8/67	4/60	-	-	2/70	20/71	0-20
pink microsteris	MIGR	2/67	1/20	-	-	1/10	2/43	0-3
rock		1/33	2/50	1/100	1/33	1/50	2/43	0-10
bare ground		7/100	10/100	40/100	23/100	18/100	26/100	1-30
moss		9/100	9/70	-	3/33	8/70	-	0-20
litter		53/100	45/100	5/100	6/100	41/100	6/100	0-90
Herbage Production (lbs/acre dry wt.)								
bluebunch wheatgrass		263	165	47	0	13		0-670
Idaho fescue		796	613	11	0	0		300-1500
other spp		443	454	354	925	580		160-380
Kentucky bluegrass		0	145	188	0	647		0-80
Total		1,502	1,377	600	925	1,240		980-2400

* Principal Indicator Species

Vegetative Composition - This plant association occurs on distinct, raised mounds separated by scabland or swales as part of a patterned ground complex on ridgetops. Deep soil mounds dominated by Idaho fescue (FEID) characterize this type in late and mid seral stages. Rhizomatous bluebunch wheatgrass (AGSP) is always present in late seral communities with Idaho fescue (approximately 1:4 ratio) and prairie junegrass (KOCR). Sandberg's bluegrass and Kentucky bluegrass are almost always associated, but in low amounts. The type is usually forb-rich with a variety of moist-site perennials; i.e., cinquefoils (POGR, POGL), twin arnica (ARSO), thin-leaved owl-clover (ORTE), red avens (GETR), and red besseya (BERU). Red avens increases with disturbance and is more abundant on gopher disturbance patches common to mound centers. Wyeth's buckwheat (ERHE) is abundant in many mound centers and will aggressively occupy entire mound tops with continual overgrazing of grasses and palatable forbs. Annual vegetation is scant in the late seral stage.

As mound tops are degraded, Wyeth's buckwheat increases while the principal bunchgrasses (FEID, AGSP) decline. However, prairie junegrass, Sandberg's and Kentucky bluegrasses all demonstrate strong tendencies to increase in frequency with disturbance. Kentucky bluegrass and prairie junegrass increase through mid and early seral stages, but decline in very early seral communities while Sandberg's bluegrass continues to increase.

Twin arnica and field chickweed (CEAR), considered increasers on FEID-KOCR slopes, both tend to decline on these mounded sites. Other increasing forbs are yarrow (ACMIL), slender and sticky cinquefoils (POGR, POGL), and lupines. Swale desert-parsley is especially prominent on degraded mound crests.

Very early seral FEID-KOCR mounds and those where Kentucky bluegrass has invaded may be characterized by complete loss of Idaho fescue, red avens, and red besseya; the most sensitive plants to overgrazing. Bluebunch wheatgrass persists on some sites, but is replaced on others. Often mounds in the very early seral stage are completely dominated by either Wyeth's buckwheat, cheatgrass, or yarrow. Always present in very early seral communities are high amounts of Sandberg's bluegrass, cheatgrass, and Douglas' Knotweed. Cluster tarweed (MAGL) and low gumweed (GRNA) are two invading species characteristic of severely degraded areas.

Mounds dominated by Kentucky bluegrass are common on the more moist patterned ground ridgetop sites where animal usage has eliminated the perennial bunchgrasses. On these mounds, Kentucky bluegrass dominates in high coverage (mean: 36%). Most commonly present with the bluegrass are Wyeth's buckwheat, prairie junegrass, Sandberg's bluegrass, yarrow, and cluster tarweed. Both major bunchgrasses (FEID, AGSP) are essentially replaced by the aggressive rhizomatous Kentucky bluegrass stand. Slender cinquefoil (POGR) may increase substantially on these mounds as colonizers of ground squirrel-disturbed spots. With increased overgrazing, Kentucky bluegrass is often replaced by perennial noxious weeds or undesirable annual vegetation (i.e., cluster tarweed).

Slopes of mounds are very unstable from spring frost heaving of the soils as well as displacement due to animal trafficking. Deep rooted plants usually occupy the tops to upper mound portions while encroachment by scabland plant members (i.e., Sandberg's bluegrass, one-spike oatgrass, Douglas' knotweed, stonecrop) occurs on the lower mound aprons.

Distribution and Environmental Features - Mounded topography in the northeastern Oregon-southwestern Washington area has probably resulted from a combination of factors. A periglacial climate following loessal deposition resulted in frost-heaving of the soil mantle on a grand scale. Melting snow and ice along with precipitation then eroded and sculpted the loess mantle into mounds and trenches about 10,000-11,000 years ago (Fosberg-1965). Subsequent annual freeze-thaw as well as annual spring run-off have continued to sort stones and gravels to form the mounded topography with surrounding stone nets that exist today. Mounded topography occurs principally on ridgetops of the dissected plateau with notable areas of concentration located on the Zumwalt Prairie, Mormon and Marr Flats. These mounded areas tend to be transitional to FEID-KOCR tops and forested communities where soils are of uniform depth. Elevations of FEID-KOCR mound communities range from 4,000 to 5,900 feet (mean: 4,800). Slopes are gentle, ranging from 2 to 11% (mean: 4%). Mounds are usually well-defined and average 2-1/2 feet in height above the adjacent scablands.

Soils: Soils are typically very dark brown to black in color in the upper layers, less than 35 inches in depth, and formed in loess deposits over basalt bedrock. Mixing of silt-sized loess and gravel-sized basalt colluvium occurs where frost action or rodent activity is common. Rock fragments are usually less than 15% and never greater than 35% by volume except near the bedrock contact. Sub-soils are silt loams or loams overlain by silt loams in surface horizons and contain less than 15% cover of rock fragments on the soil surface. Although most soil characteristics are generally uniform across mounds, the depth of soil and coarse fragment content varies in different portions of the mound. Depth is greatest from the flattened mound center, while sloping mound aprons are shallower and usually contain more rock fragments.

Summary of Soil and Site Characteristics (all samples) - FEID-KOCR mounds

Total Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
20 in. to 40 in.	15 in. to 35 in.	5 in. to 22 in.	5 in. to 32 in.	stable	53°F to 55°F	8-22 in. or absent	0 to 10%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - FEID-KOCR mounds are separated by swales, stone nets, or POSA3-DAUN scabland. FEID-KOCR ridgetops consist of non-patterned deep-soil, often narrow ridgetops usually adjacent to the FEID-KOCR mound type. Other mounded topography occurring on the ridgetops may contain mountain snowberry (SYOR) and/or mountain big sagebrush (ARTRV) communities.

Northern hemispheres of mounds tend to have higher fescue composition, with bluebunch wheatgrass often more abundant on southern mound exposures. FEID-KOCR stands often retrogress to red avens (GETR), cinquefoils (POGR, POGL), or other forbs preceeding an ERHE/POPR disclimax. More xeric mounded topography often degenerates to a disclimax of annual bromes, buckwheat, or yarrow. The final stage in a retrogressive sequence is domination by cluster tarweed (MAGL). Deerhorn (CLPU) and collomia (COLI2) are two annual forbs that often become very abundant on the tops of mounded structures when churning of soils by gophers and ungulate use eliminate the perennial vegetation. Retrogression on mounds may not always result in soil loss or change in site potential.

Synecological Relationship - FEID-KOCR mounds (in late and mid seral stages) differ from other FEID-KOCR types (in late and mid seral stages) by the following features:

1. lowest coverage by mosses and lichens (9%)
2. highest abundance of KOCR, POPR, ARSO, CEAR, POGR, and GETR
3. highest FEID coverage of the ridgetop FEID-KOCR types (38%)
4. occurrence on distinct, patterned ground landscapes.

Role of Fire - Idaho fescue tends to be more susceptible to fire damage than either bluebunch wheatgrass or Kentucky bluegrass. As with bluebunch wheatgrass, Idaho fescue will be damaged by hot fires in summer and fall when moisture is limited. Prescribed burning should be done in spring or late fall when soil moisture levels are adequate to protect root crowns. Fire, however, may not be a desirable tool if Idaho fescue is to be maintained or promoted in the stand. Hot burns may induce the more fire-resistant Kentucky bluegrass to invade.

Management Considerations - Although discontinuous, the ridgetop orientation of the mounds, with their deep soil and high-productive potential, makes re-seeding a viable alternative in many cases. Reseeding with fescues and wheatgrasses should result in successful reestablishment unless Kentucky bluegrass and buckwheat composition is continuous. Management for FEID and AGSP may be the most desirable alternative based on producing a more diverse community with higher species preferability for ungulates. Kentucky bluegrass mounds provide a highly productive forage with ability to withstand heavy grazing pressure. However, revegetation of the Kentucky bluegrass stands to other species will require a significant rehabilitation investment. Idaho fescue is more susceptible to elimination by sheep while bluebunch wheatgrass is more sensitive to heavy use by cattle and elk. Both species require respite from utilization during the critical flowering to seed-set stages for retention of vigor (Mueggler 1967). Idaho fescue and bluebunch wheatgrass not usually flower simultaneously. Turn-on of livestock should be after both species have set and ripened seed (usually in June). Idaho fescue can withstand heavy grazing in mid-summer following seed-set. Ungulates may even promote Idaho fescue at this time by trampling seed into the soil (Mueggler and Stewart - 1980).

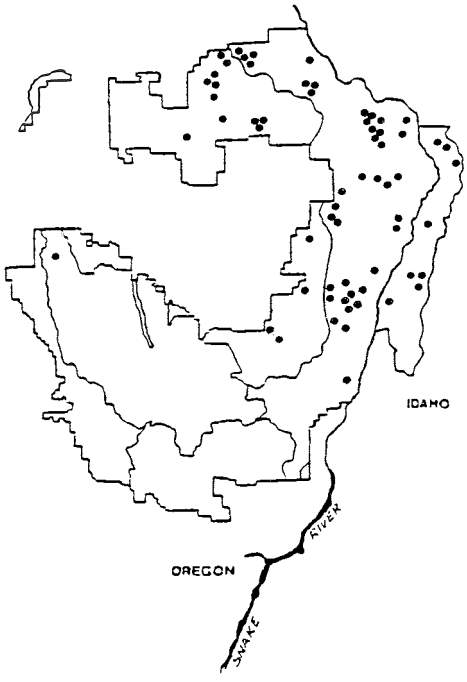
Productivity - Communities on mounded topography in late and mid seral stages can have the highest total forage production of all upland steppe plant associations. However, production of Idaho fescue tends to be greater in FEID-KOCR (low) plant communities. Bluebunch wheatgrass has comparatively low production in all seral stages. Idaho fescue and bluebunch wheatgrass in combination can decrease up to a third in mid seral communities and may be completely absent in early and very early seral stages. Production by other forage species remains relatively constant in late, mid, and early seral stages, but in very early seral communities nearly doubles due to proliferation of annual bromes and perennial forbs. Mounds dominated by Kentucky bluegrass can also be very productive. This species produces nearly equal herbage amounts as Idaho fescue in late and mid seral communities and forb production is usually quite substantial. Total production, however, is less on Kentucky bluegrass-dominated mounds due to their lower bluebunch wheatgrass production.

Comparison With Other Studies - The FEID-KOCR plant association on mounded topography has not been described previously.

5. Vance Knoll (Wallowa Valley Ranger District)

Idaho fescue - prairie junegrass (high elevation) plant association
Festuca idahoensis - Koeleria cristata
(FEID-KOCR) (high elevation) (GB59 13)

6. Deadhorse Ridge (Hells Canyon NRA) *Plot 548*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: loess + basalt colluvium
Elevation: (4800 ft.) 3800-6600 ft.	Solum depth: (48 in.) 24-60 in.
Aspect: (SW + E) NE to W	Loess depth: (14 in.) 5-27 in.
Slope (50%) 30-75%	Root conc: (20 in.) 12-30 in.
Position: (upper 1/3) mid to upper 1/3 slopes	Depth to GT 35% rock frag./size: (30 in.) 15-40 in./gravels
Other: sites overlap with FEID-AGSP high at upper elevations	Surface soil/subsoil texture: silt loam,loam/silty clay loam,clay loam

Table of Principal Species

FEID-KOCR (high elevation) (n = 64)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=16)	Mid Seral (n=27)	Early Seral (n=13)	Very Early Seral (n=8)	Late-Mid Seral Range
Shrub						
Wyeth's buckwheat	ERHE	4/81	4/70	4/62	7/63	0-15
Grasses						
*Idaho fescue	FEID	29/100	22/100	10/100	2/88	10-55
*prairie junegrass	KOCR	3/88	3/85	6/92	4/75	0-10
Sandberg's bluegrass	POSA3	5/44	4/56	6/85	3/75	0-15
*bluebunch wheatgrass	AGSP	24/100	24/100	29/100	18/100	3-65
soft chess	BRMO	3/19	5/22	5/8	-	0-15
cheatgrass	BRTE	1/25	3/11	8/31	3/25	0-5
rattlesnake brome	BRBR	2/63	5/48	11/85	6/88	0-15
Perennial Forbs						
*twin arnica	ARSO	2/38	6/37	5/23	5/13	0-25
red besseya	BERU	2/25	1/33	1/15	1/13	0-5
*wild hyacinth	BRDO	1/38	1/37	1/31	1/63	0-3
red avens	GETR	2/31	2/33	1/8	1/13	0-5
*white stemmed frasera	FRAL2	3/25	2/22	3/8	-	0-5
*western hawkweed	HIAL2	2/75	4/59	2/38	5/13	0-20
*harsh paintbrush	CAHI2	1/31	3/48	3/15	3/50	0-15
yarrow	ACMIL	3/94	6/93	6/100	4/100	0-20
Sheldon's milkvetch	ASRES	3/13	2/31	2/46	-	0-5
Missouri goldenrod	SOMI	2/44	4/26	1/8	1/13	0-20
*lupine spp.	LUPIN	6/88	9/89	13/92	5/88	0-25
arrowleaf balsamroot	BASA	3/50	11/48	11/69	13/100	0-30
common goatweed	HYPE	2/50	1/4	1/8	5/13	0-5
wayside gromwell	LIRU	1/44	1/41	2/38	1/63	0-3
*yellow salsify	TRDU	2/44	1/59	1/62	2/75	0-5
field chickweed	CEAR	6/50	9/41	18/15	11/25	0-20
meadow death camas	ZIVEG	2/19	1/44	1/38	3/13	0-3
Annual Forbs						
prickly lettuce	LASE	1/25	1/37	1/46	1/63	0-3
*deerhorn	CLPU	3/56	7/56	6/54	9/50	0-25
narrow leaved collomia	COLI2	1/13	2/22	1/69	3/13	0-5
blue forget-me-not	MYMI	-	1/19	3/8	1/25	0-1
*common speedwell	VEAR	1/31	7/19	13/38	-	0-30
Douglas' knotweed	PODO	1/13	1/7	1/8	-	0-1
*thyme leaf sandwort	ARSE	3/19	7/22	3/15	2/38	0-15
tall annual willowweed	EPPA	1/31	1/30	1/23	11/25	0-3
pale allysum	ALAL	1/13	1/33	6/38	1/13	0-5
threadleaf phacelia	PHLI	3/6	1/19	1/38	2/38	0-3
rock		7/69	11/89	11/77	5/100	0-30
gravel		5/19	6/48	3/38	6/63	0-15
bareground		9/100	12/100	14/100	15/100	1-35
moss		14/75	11/67	8/77	3/50	0-70
litter		39/100	29/100	22/100	36/100	1-90

Herbage Production (lbs/acre, dry wt.)

bluebunch wheatgrass	390	360	320	100-930
Idaho fescue	260	220	130	70-330
other forage spp.	250	220	230	45-660
Total	900	800	680	530-1800

* Principal Indicator Species

Vegetative Composition - This plant association represents one of the most extensive grassland communities found at high elevations in the Wallowa-Snake Province. It occurs on mid to upper canyon slopes where a highly productive grass-forb composition is produced from a combination of increased precipitation, seepages, and longer spring/early summer moisture retention capability of the deep rich soils. In the late seral stage, bluebunch wheatgrass (AGSP) and Idaho fescue (FEID) are always present and tend to co-dominate stands. Prairie junegrass (KOCR) and Sandberg's bluegrass (POSA3) are low in cover and may be absent on the steep slopes. As with the FEID-KOCR (low) type, some forb species are consistent associates of FEID-KOCR grassland slopes. These include: wild hyacinth (BRDO), white stemmed frasera (FRAL2), harsh paintbrush (CAHI2), western hawkweed (HIAL2), and twin arnica (ARSO). Annual bromes and forbs are often present in the interspaces between perennials. The most frequent annuals in late seral communities are common speedwell (VEAR), thyme leaf sandwort (ARSE), and rattlesnake brome (BRBR). Bluebunch wheatgrass tends to be rhizomatous at higher elevations in this type.

FEID-KOCR is a forb-rich type, especially so on the upper steep slopes of canyons beneath rim seepages. Principal perennial forbs occurring are: arrowleaf balsamroot, field chickweed, wild hyacinth, western hawkweed, harsh paintbrush, silky lupine, yarrow, and yellow salsify. Twin arnica is present, but is more active as an increaser on the more gentle slopes of the FEID-KOCR ridgetop sites. Wyeth's buckwheat is commonly present. Little sunflower (HEUN), Missouri goldenrod (SOMI), and showy fleabane (ERSP) may be very abundant on some disturbed sites. Silky lupine is the most common lupine of the FEID-KOCR types. Sheldon's milkvetch (ASRES) is infrequently found, but is indicative of the FEID-KOCR higher elevation grasslands.

With disturbance, there is a decline in Idaho fescue and bluebunch wheatgrass. The associated moss usually occurring among the bunches also declines. Bare ground increases with a filling-in by annuals and perennials. Arrowleaf balsamroot, lupines, and field chickweed are the principal increasing perennials. Kentucky bluegrass ceases to be the primary increaser on steep FEID-KOCR sites when slopes exceed 35%. Grasses that tend to increase with disturbance are prairie junegrass, Sandberg's bluegrass, and annual bromes (BRBR, BRMO, BRTE); the most frequent being rattlesnake brome (BRBR). On shallower substrates and hotter sites, deerhorn (CLPU) appears to become one of the more dominant annuals. Other annual forbs of importance in this type are thyme leaf sandwort (ARSE), common speedwell (VEAR), blue forget-me-not (MYMI), prickly lettuce (LASE), and pale allysum (ALAL). The principal invader of these sites is common goatweed (HYPE), a noxious perennial plant prone to occupy some of the deeper soils and better sites when native vegetation is degraded.

Distribution and Environmental Features - Communities of the FEID-KOCR (high) plant association occur throughout the canyonlands and are one of the most common bunchgrass types of the Hells Canyon NRA and Wallowa Valley Ranger Districts. They are especially common on upper canyon slopes, but can also occur at mid slope positions below rim outcroppings where moisture is retained longer into the summer drought period. Elevations range from 3,800 to 6,600 feet (mean: 4,800), the highest extension of steep slope bunchgrass types in the forest zone. Found almost always in areas of Yakima basalt flows, the type occurs most commonly on steep backslopes just below ridge crests. As the distance away from ridgetops increases, FEID-KOCR communities become less extensive and sites are eventually dominated by FEID-AGSP communities. Typical sites have steep slopes (range 30-75, mean: 50%) and northeast to west-northwest aspects between 4,500 and 6,500

feet elevation. Slumping and terracettes are less frequent in these communities than in the FEID-KOCR (low) type due to shallower depth of loess over the residual soils. Surface relief is also less variable, predominantly convex to smooth, although some sites may have concave surfaces.

Soils: Soils are typically very dark brown in color in upper layers, greater than 48 inches in depth, and formed in mixtures of accumulated loess and basalt colluvium. Surface layers have silt loam to loam textures and usually less than 35% rock fragments by volume. Subsoils are often buried residual soils having greater than 35% rock fragments with some clay concentration. Textures are silty clay loams, clay loams or occasionally clays.

Rock fragments in surface layers tend to be gravel-sized, while stones, cobbles, and gravel may increase greatly in the subsoil. In general, surface coarse fragments are few and never exceed 15% cover.

Soil characteristics may vary considerably across FEID-KOCR slopes due to differences in slope stability and irregular accumulation of colluvium and loess over different segments of basalt flows. In addition, where bedrock fracturing and tilting provide subsurface water, shallower soils may be capable of supporting FEID-KOCR communities. Shallower soils are also more common at upper slopes and ridgebrow positions. Below these positions, soil accumulation is usually greater and mixing of coarse colluvium and loess more pronounced. Relatively narrow inter-rim sites tend to have greater clay content in subsoils, presumably due to greater site stability over a longer time period.

Summary of Soil and Site Characteristics (all samples) - FEID-KOCR high elevation

Total Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
14 in. to 75 in.	12 in. to 30 in.	4 in. to 30 in.	10 in. to 30 in.	unstable to mod. stable	53°F to 62°F	surface to 40 in.	less than 10%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationship - The ridgetops and upper-third slope levels are capable of supporting FEID-KOCR communities due to lower diurnal temperatures and higher soil moisture lasting well into the summer season. The moisture-sensitive fescue is able to compete and persist on these slopes until the moisture becomes limiting and temperatures become too hot to support it. At this point, bluebunch wheatgrass and other drought-tolerant species become more dominant.

As distance is increased away from the ridge-brow downslope, FEID-KOCR will become less pronounced, usually merging with FEID-AGSP communities until the sites are dominated by this more xeric type. Early season surface flow and subsurface moisture availability from basalt flow layers at drought periods in summer often creates the necessary conditions for domination by FEID-KOCR communities. At mid-slope levels, the inter-rim slope just above a major flow layer often has lost seepage water from the above rim to the extent that fescue can no longer persist. An AGSP-POSA3 community is often encountered on these sites.

Series Relationship - FEID-KOCR (high) communities are often adjacent to FEID-KOCR (tops), FEID-AGSP, AGSP-POSA3 (basalt) and AGSP-POSA3/SCAN plant communities.

In comparison to the other FEID-KOCR types, FEID-KOCR high elevation slopes in late and mid seral stages contain the highest bluebunch wheatgrass and the lowest Idaho fescue coverages. Forbs with greater frequency in this type are: western hawkweed, Missouri goldenrod, silky lupine, arrowleaf balsamroot, and wayside gromwell. Deerhorn is most frequently found in this type over all other FEID-KOCR communities.

Plots paired at the 4,500-4,600 foot elevational level of Tryon Saddle provide a contrast between the FEID-KOCR (high) and FEID-AGSP/LUSE communities. An east-facing FEID-KOCR (high) site and a west-facing FEID-AGSP/LUSE site were compared. The following dissimilarities between the types were observed:

1. Depth of loess and total soil depth were greater on the FEID-KOCR site (19-70 in.) than on the FEID-AGSP site (15-22 in.).

2. Field chickweed and western hawkweed were absent from FEID-AGSP/LUSE, but common on the FEID-KOCR type.

3. Rock and gravel percentages were substantially higher on FEID-AGSP/ LUSE site.

By comparing all sample plots in these communities, other relationships between FEID-KOCR (high) and FEID-AGSP communities of importance include:

1. Coverage of fescue is double on FEID-KOCR sites.

2. AGSP and POSA3 coverage is essentially equivalent between the types.

3. GETR, HIAL2, SOMI, and other members of the KOCR union are usually absent in FEID-AGSP communities.

4. Soils are usually shallower and more often higher in rock and gravel content in FEID-AGSP communities. This type is the rockiest of the FEID-KOCR groups (10%) with FEID-AGSP types averaging 15-37% in rock cover.

Role of Fire - Primary species to manage are Idaho fescue and bluebunch wheatgrass. Burns should be avoided during the droughty months of summer and early fall as both bunchgrasses may be adversely affected. The primary increaser, balsamroot, is usually not damaged by fire and may in fact become more frequent as a result of burning. To promote maximum species diversity for wildlife, fire may be a good tool in this type because the component forbs will generally be enhanced (i.e., balsamroot, lupine, yarrow. These species with spreading rootstocks or rootshoots are generally least harmed and spread most rapidly following burning (Wright, et al - 1979). A fall burn will generally enhance forbs.

Management Considerations - Communities in the FEID-KOCR (high) type are more susceptible to trampling damage late into the summer because of longer soil moisture retention at high elevation sites. Idaho fescue, Sandberg's bluegrass, and prairie junegrass are especially vulnerable to displacement by ungulate movement on these steep slopes. Another principal impact to the community may come

from ungulates moving off winter range in lower canyons to summer range on ridge-tops at a time when primary bunchgrasses are most physiologically susceptible to grazing damage (usually May to mid July, depending on elevation).

This forb-rich type provides good to excellent sheep range. Cattle are less desirable due to soil-vegetative displacement problems. Additionally, sheep can be herded and kept off FEID-KOCR ranges prior to range readiness more easily than cattle. Revegetation and other cultural site enhancement activities may be prohibited by steepness of slope and the remote location of this type.

Productivity - Total herbage production is high with a good mixture of Idaho fescue, bluebunch wheatgrass, and forb species available.

In late and mid seral stages, fescue production is the lowest of all FEID-KOCR types, but production of bluebunch wheatgrass is the highest. These grasses may produce 25% less herbage in early seral communities. Total production by all forage species may also be 25% less in early seral communities.

Comparison with Other Studies - The FEID-KOCR plant association has been described by Poulton (1955); Campbell (1962); and Tisdale (1979-1986). This high elevation type is more similar floristically to Tisdale's FEID-KOCR habitat type than is FEID-KOCR (low). The separation of the FEID-KOCR floristic unit into high elevation and low elevation plant association has not been previously done.

Common snowberry/Idaho fescue-prairie junegrass plant community type
Symphoricarpos albus/Festuca idahoensis - Koeleria cristata (SYAL/FEID-KOCR) (GB59 19) (n = 4)

Common snowberry occurs on steep slopes at higher elevations of the canyon grasslands where moisture is available longer into the summer drought season due to aspect and/or subsurface seepage. In these grasslands, the snowberry generally is scattered and low in habit such that the grasses appear to mask the shrub occurrence. Bunchgrasses (i.e., Idaho fescue, bluebunch wheatgrass, prairie junegrass, and Sandberg's bluegrass) tend to dominate 4:1 over the snowberry. Other common associates are rattlesnake brome (BRBR), arrowleaf balsamroot (BASA), lupines (especially silky lupine-LUSE), yarrow (ACMIL), gromwell (LIRU), and deerhorn (CLPU). Generally, but not always, in proximity are forested stringer communities where shrub-dominated understories occupy northerly slopes. The occurrence of these communities in the canyonlands of northeastern Oregon is limited. This type is recognized in southeastern Washington and northern Idaho as a mesic community occurring on loessal soils with perhaps greater geographic extension (Daubenmire 1970). Common snowberry shrublands (SYAL-ROSA plant association) generally occur below 4,000 feet elevation and are usually dominated by the shrubs with grasses much more subordinate. Sample plots occurred at 4,000 feet and above in these SYAL/FEID-KOCR communities.

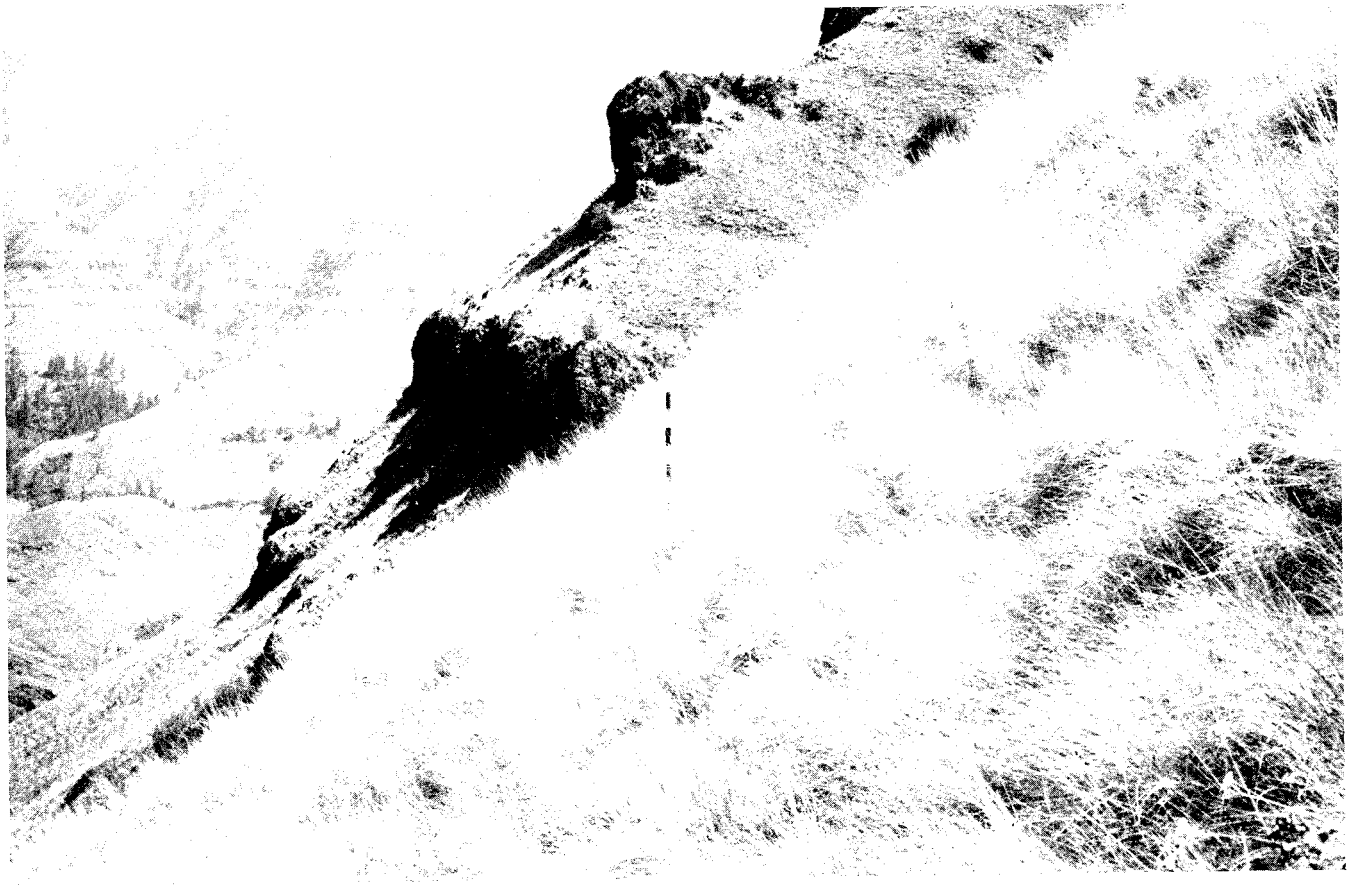
Snake River Degenerated Bench Plant Community Type (MD31 12) (n = 6)

Overgrazed plant communities generally occur on the gentle slope (less than 20%) benchlands of the Snake River Canyon on deep clayey soils. These sites probably once contained the FEID-KOCR plant association vegetation characteristic of deep, rich soils where moisture is not limiting. These gentle benchlands are typically located where the Yakima and Picture Gorge basalts interface (Vallier-1973).

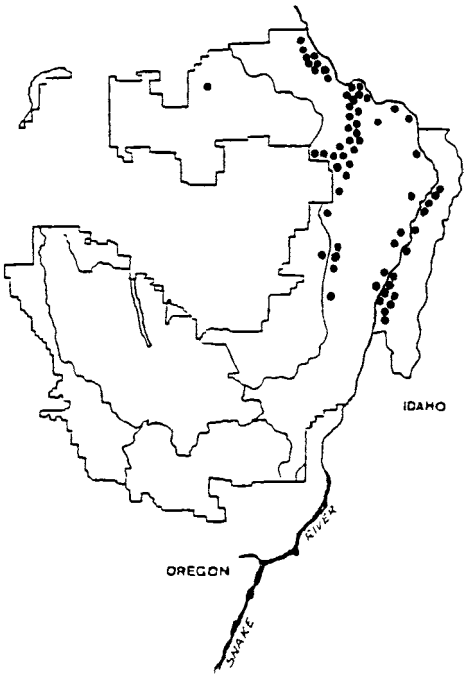
Generally Idaho fescue and prairie junegrass are absent. Rhizomatous bluebunch wheatgrass usually occurs with 15-25% foliar cover in early seral stands, but it becomes relict in very early seral stands. Yarrow is always present and probably has increased from past disturbance. The principal species replacing Idaho fescue is Kentucky bluegrass (up to 95% foliar cover on some sites). On more highly disturbed sites, red three awn (ARLO3), annual bromes (BRCO, BRJA, BRBR), chickweed (CEAR, CEVI), twin arnica (ARSO), annual fescues (FEME, FEMI), and goatweed (HYPE) may be found in weedy patches. Bulbous bluegrass (POBU) has invaded benchlands near Spring and McGraw Creeks in the upper Snake River Canyon with Kentucky bluegrass on the Columbia River basalts. Kentucky bluegrass is absent from associated limestone outcrops in this vicinity. Diminutive plants indicative of heavily disturbed bunchgrass benches are dandelion (TAOF), small-flowered fringecup (LIPA), and storksbill (ERCI).

The Kentucky bluegrass-dominated benchlands can be highly productive (600 lbs/acre dry wt.). Reseeding practices can be successful especially on stone-free portions of the benches where hay fields were once cultivated. Burning may change some forb-rich communities with resulting increases by Kentucky bluegrass. Annual vegetation may temporarily increase (i.e., annual bromes and annual fescues) following hot fires in late summer.

Idaho fescue - prairie junegrass (low elevation) plant association
Festuca idahoensis - Koeleria cristata
(FEID-KOCR) (low elevation) (GB59 14)



7. Log Creek Canyon (Hells Canyon NRA) ***Plot 432***



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: loess + colluvium, various geol.
Elevation: (2600 ft.) 1200-3850 ft.	Solum depth: (70 in.) 51-80 in.
Aspect: (NE to NW) ENE to WNW	Loess depth: (24 in.) 15-35 in.
Slope (61%) 35-90%	Root conc: (30 in.) 22-40 in.
Position: (lower 1/3) lower 1/3 to upper 1/3 slopes	Depth to GT 35% rock frag./size: (60 in.) 35-80 in./gravels
Other: lowest elevation extension of Idaho fescue dominated sites	Surface soil/subsoil texture: silt loam, loam /silt loam, silty clay loam

Table of Principal Species

FEID-KOCR (low elevation) (n = 64)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=18)	Mid Seral (n=26)	Early Seral (n=10)	Very Early Seral (n=10)	Late-Mid Seral Range
Grasses						
*Idaho fescue	FEID	53/100	32/100	20/100	4/30	20-90
prairie junegrass	KOCR	2/50	2/85	2/70	3/40	0-5
*bluebunch wheatgrass	AGSP	12/78	26/100	21/90	27/100	0-40
Sandberg's bluegrass	POSA3	6/28	2/42	3/50	1/50	0-10
*Rattlesnake brome	BRBR	3/28	6/65	10/50	8/20	0-25
cheatgrass	BRTE	1/11	1/12	13/30	10/50	0-1
Japanese brome	BRJA	2/11	1/19	15/10	12/40	0-3
foxtail fescue	FEME	1/28	2/27	8/20	5/40	0-5
Forbs						
*western hawkweed	HIAL2	2/61	2/50	3/60	1/30	0-5
*twin arnica	ARSO	5/50	5/62	7/60	1/10	0-20
red besseya	BERU	2/44	2/31	3/20	-	0-5
*wild hyacinth	BRDO	1/61	1/58	1/70	1/20	0-3
*white stemmed frasera	FRAL2	1/50	2/38	1/20	1/10	0-5
woodsia	WOOR	1/28	1/42	1/30	1/30	0-3
yarrow	ACMIL	2/94	5/81	3/70	6/100	0-15
lupine spp	LUPIN	7/33	14/27	11/60	21/40	0-20
arrowleaf balsamroot	BASA	3/33	5/50	16/40	2/40	0-20
*Snake River phlox	PHCO2	1/72	1/69	2/60	1/60	0-3
pale agoseris	AGGL	1/39	1/46	2/30	1/20	0-1
common goatweed	HYPE	1/50	1/42	3/40	5/50	0-3
yellow salsify	TRDU	1/17	1/15	1/20	2/20	0-1
field chickweed	CEAR	4/44	6/54	9/60	1/20	0-20
groundsel	SEIN	1/17	2/31	1/30	-	0-5
Missouri goldenrod	SOMI	2/22	6/23	8/30	1/10	0-20
wayside gromwell	LIRU	2/22	2/31	2/30	1/20	0-5
harsh paintbrush	CAHI2	1/44	2/50	3/20	1/30	0-5
Annual Forbs						
*cleavers	GAAP	3/44	3/31	1/30	7/20	0-15
blue forget-me-not	MYMI	1/28	1/23	1/30	3/50	0-1
*common speedwell	VEAR	8/22	13/23	15/50	17/30	0-30
*tonella	TOFL2	1/17	3/15	1/10	28/20	0-10
thyme leaf sandwort	ARSE	5/28	2/31	7/40	2/30	0-10
deerhorn	CLPU	1/22	1/15	1/30	1/30	0-3
rock		1/50	4/38	3/40	3/70	0-15
gravel		1/6	1/12	1/20	3/20	0-1
bare ground		4/72	5/81	6/80	7/90	0-25
moss		47/100	35/100	25/90	26/90	5-90
litter		54/100	55/100	36/100	38/100	5-95
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		200	330		670	20-570
Idaho fescue		700	400		0	100-1400
other species		100	200		270	10-470
Total		1,000	930		940	450-1700

* Principal Indicator Species

Vegetative Composition - This FEID-KOCR plant association represents extensive low elevation, highly productive bunchgrass communities found in deep soil on steep, north-facing canyon slopes. The type is dominated by Idaho fescue (FEID) in a 4:1 ratio over bluebunch wheatgrass (AGSP) in the late seral stage. Prairie junegrass (KOCR) and Sandberg's bluegrass (POSA3) are present, but with low cover and may be absent from late seral communities. However, some members of the junegrass union of plants are always present -- though at lower coverage levels in these often dense fescue stands. Prairie junegrass union members are wild hyacinth (BRDO), white stemmed frasera (FRAL2), red besseya (BERU), western hawkweed (HIAL2), and twin arnica (ARSO). Perennial forbs reflecting the lower elevations are: Snake River phlox (PHCO2), woodsia (WOOR), frasera (FRAL2), and goatweed (HYPE). Common annuals in late seral communities are: rattlesnake brome (BRBR), blue forget-me-not (MYMI), cleavers (GAAP), sandwort (ARSE), and common speedwell (VEAR).

In early seral stands, fescue cover declines significantly while bluebunch wheatgrass cover increases noticeably. This is the only bunchgrass community that was observed to have such a dramatic increase in bluebunch wheatgrass foliar coverage in lower seral stages. Bluebunch wheatgrass decreased following disturbance in all other bunchgrass communities. Annual bromes, especially cheatgrass and rattlesnake brome, increase in gaps left within the dense bunchgrass stands following disturbance. Perennial forbs that increase with disturbance are: twin arnica, yarrow, field chickweed, silky lupine, and arrowleaf balsamroot. Perennial forbs often forming colonies in these stands are: groundsel, goldenrod, and paintbrushes.

The highly disturbed early and very early seral FEID-KOCR (low) communities may contain high coverage of tonella (TOFL2), cleavers (GAAP), goatweed (HYPE), yellow salsify (TRDU), or field chickweed (CEAR). The hooked barblike bristles present on the fruits and stems of cleavers plants allow it to be readily transported by animals and to aggressively invade deep, moist soils on north-facing canyon slopes.

Trailing disturbance can cover a significant amount of area on these steep, stone-free slopes. Often defining such disturbance are the following annuals: common speedwell, cleavers, sandwort, and tonella. Foxtail fescue (FEME) is a dramatic opportunist on disturbed soil in this type. Cleavers is restricted in its occurrence in bunchgrass types to this FEID-KOCR association at lower elevations.

Festuca scabrella (rough fescue) was found flowering earlier than Idaho fescue in some of these FEID-KOCR communities. It is, however, uncommon in the Wallowa-Snake Province, but can be mistaken for FEID in the vegetative state. Its range is primarily north of the Palouse in eastern Washington, northern Idaho and Canada.

Distribution and Environmental Features - FEID-KOCR communities at low elevations (below 3,800 feet) occur only in the Imnaha and Snake River drainages of the Hells Canyon NRA. The climate is hot and dry in these deep canyons and typically supports more xeric bunchgrass communities of the bluebunch wheatgrass series. The occurrence of FEID-KOCR communities at low elevations is possible only on sites where deep rich soils and northerly aspects provide favorable environmental conditions for the associated moist-site species. Because of the diverse slope orientations common in the deeply dissected canyons and the large amounts of silt-sized material (loess) deposited over this area during post glacial periods,

a significant portion of the landscape is dominated by FEID-KOCR communities. These communities are most widespread in areas of Imnaha basalt flows, common on Yakima basalt flows, and even occur on metavolcanic or sedimentary substrates.

Elevations of FEID-KOCR sites range from 1,200 to 3,850 feet (mean: 2,600); the lowest extension of any fescue-dominated community in the Hells Canyon NRA. Sites are typically footslopes, inter-rim slopes, or extensive remnant colluvial slopes, all having deep accumulations of loess over residual soils. Terracettes, formed from a combination of soil creep and animal trafficking, and soil slumping are common on these steep (range, 35-90%, mean, 61%) sites. Surface microrelief is variable due to this soil movement, but is usually concave or smooth. Communities occur predominantly in lower slope positions but are also located at mid slope and upper slope levels. Although confined on northwest through northeast-facing slopes at elevations below 3,000 feet, the FEID-KOCR (low) communities will occupy more easterly or westerly aspects at higher elevations.

Soils: Soils are typically very dark brown to black in color in upper layers, greater than 50 inches in depth, and formed in deep loess accumulations over old soils buried at depths of 12 to 40 inches (mean 24 in.). Surface layers have silt or silt loam textures with less than 15% rock fragments by volume. Gravels are the most common rock fragments present, but surface soil layers are often free of all coarse materials. Some subsurface layers are also formed in loess, have less than 35% rock fragments, with silt loam or loam textures. More often subsurface soils are formed in other materials and will vary depending on the nature of the parent material and soil development prior to loess deposition. Most lack concentrations of clay and are loam, sandy loam, or silty loam textured with fewer than 35% rock fragments throughout. Parent materials are basalt or metabasalt or occasionally granodiorite or sedimentary rock. Surface rock is usually absent.

Soils may vary considerably in depth, clay content, and degree of calcium accumulation. Deeper soils are present where loess and colluvium have been able to accumulate at lower slope positions or at midslopes above extensive bedrock exposures that impede downward movement of soil and rock material. Near bedrock exposures and in upper slope positions, soils are often shallower but still usually exceed 30 inches in depth. Subsurface layers with silty clay loam, clay loam, or clay textures are more common at elevations above 2,000 feet while in the lower elevation Columbia River basalts, weak cemented layers are common near the soil-bedrock contact. Calcium accumulations are also typical in the deeper soil layers, especially in the more coarse textured loam soils.

Summary of Soil and Site Characteristics (all samples) - FEID-KOCR low elevation

Total Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
24 in. to 80 in.	16 in. to 40 in.	7 in. to 35 in.	5 in. to 23 in.	unstable to mod. stable	52°F to 60°F	16 in. to 80 in.	5%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationships - At low elevations in the canyons, mesic northfacing slopes may contain the SYAL-ROSA shrubland type. Overgrazing of FEID-KOCR on these north aspects could promote snowberry, rose, cherry, and other moist-site shrubs. There is photographic evidence that some of these communities have been

invaded by snowberry and rose in the last two decades. Lack of fire, grazing influences, and general climatic changes have probably promoted these shrublands to increase.

Bluebunch wheatgrass may increase on FEID-KOCR (low) slopes following continued overgrazing. This increase is probably due to the decreased competition with Idaho fescue on these sites. Some indication of this can be seen in the data from paired plots at one FEID-KOCR site located at 1,200 feet elevation in the Snake River Canyon. These plots sampled a moderately grazed late seral community and one with a history of heavy grazing, reflecting an early seral condition. Both stands had northeasterly aspects and deep loess-influenced soils. A short comparative chart (below) dramatizes some of the retrogressive relationships within the type:

Late Seral Stage (% Cover)			Early Seral Stage (% Cover)
53	Idaho fescue	cover	1
11	bluebunch wheatgrass	cover	22
0	cheatgrass	cover	4
1	foxtail fescue	cover	2
529	Idaho fescue	lbs/acres	0
157	bluebunch wheatgrass	lbs/acres	753
61	Other species	lbs/acre	480

Series Relationship - FEID-KOCR (low) communities are often adjacent to FEID-AGSP, AGSP-POSA3/ERPU, AGSP-POSA3/ASCU4, or AGSP-POSA3/OPPO communities on south-facing slopes. Dry site shrubland types are also commonly encountered in close proximity (i.e., smooth sumac, Snake River greenbush, mountain mahogany, netleaf hackberry). SYAL-ROSA shrublands may occur on the same slopes as FEID-KOCR communities, but in slightly deeper and more clayey soils.

The following characteristics of FEID-KOCR (low) in late and mid seral stages are used to separate this type from FEID-KOCR (high):

1. lack of Wyeth's buckwheat
2. highest fescue coverage (mean = 41% cover) and productivity (700 lbs/ac)
3. lowest elevations and steepest slopes
4. low surface coverage by rock, gravel, and bare ground; greater mean soil depth.
5. high moss composition (mean = 41% cover); other FEID-KOCR types contain less than 20%
6. infrequence or absence of red avens; presence of Snake River phlox
7. bluebunch wheatgrass reacts as an increaser instead of decreasing with fescue under disturbance

Role of Fire - The primary species for management is Idaho fescue. It is highly susceptible to damage by fire. Fire should probably be a minimally used tool in fescue-dominated types for this reason. The presence of dense fescue stands on low elevation north aspects may reflect the inability of fire to burn in these

moist-site communities. Only late autumn season burns when fescue sites are moist and plant moisture levels are high should be attempted to maintain Idaho fescue.

Management Considerations - The moist, steep, north-facing slopes and deep loess soils typical in this type combine to make these sites unstable and highly susceptible to soil displacement. Rotational slumping is frequent. Use by large, heavy animals, especially in the winter and spring when soils are near saturation, may cause serious soil movement and site deterioration. Management should be keyed to avoiding these communities until after seedset in early summer when the least physiological damage will occur. Slopes will also be more stable as they dry. Sheep can best utilize these steep, unstable sites due to their lighter weight and reduced trailing impact. In extreme cases, animal trails may remove up to half of the perennial grassland on these sites!

Most grasslands need periodic grazing or fire for maintenance of high plant vigor. Data from paired plots at the stock-proof exclosure 1,800 feet above Johnson Bar in the Snake River Canyon seem to confirm this. Here the FEID-KOCR slope was in an early seral stage. A distinctive weediness occurred where domestic grazing had been eliminated inside the exclosure. As the litter and plant cover increased, the rodent population also increased resulting in degeneration of the bunchgrass community. The exclosure contained high weedy cover of goatweed (HYPE), tumble mustard (SIAL), annual bromes (BRTE, BRBR) and tonella (TOFL2). Runways and tunnels were profuse from a population of prolific voles that resulted from an accumulation of unused plants as litter. Outside the exclosure where domestic grazing was ongoing, fescue and prairie junegrass were still present in minor amounts, but bluebunch wheatgrass was thriftier, and annual bromes and tonella were less abundant. Tumble mustard was absent. These observations indicate the need for periodic grazing or fire to maintain plant vigor in grassland communities.

Goatweed is an invader on FEID-KOCR and FEID-AGSP communities where dense weedy patches may exclude other vegetation in many areas. The plant is toxic to grazing animals; cattle are more susceptible than sheep (Range Plant Handbook - 1937). Control is difficult. Biologic control using the goatweed beetle (Chrysolina quadrigemina) has reduced the colonies of goatweed markedly since its peak in the late 1950's (Fred Talbott, personal communication). Many implantings (120-130) of the beetles were made throughout the Snake and Imnaha Canyons during the late 1940's (Wade Hall, personal communication). There is some minor use by stock of sprouting plants, but basically the species is unpalatable and undesirable. Goatweed is not unique to FEID-KOCR low elevation sites but favors deeper soils in all the FEID-AGSP and FEID-KOCR types.

Productivity - Total forage production in this type is very high with late and mid seral communities producing more Idaho fescue than in any other plant association identified on the Wallowa-Whitman National Forest. At the early and very early seral stages, the fescue component is nearly absent while bluebunch wheatgrass and forb production may more than double that found in late seral stages. In these earlier seral stages, production of wheatgrass approaches levels more common in the FEID-AGSP and AGSP/POSA3-PHCO2 communities. Decreased fescue production in mid seral communities also favors increased wheatgrass and forb production. Overall, total forage production is nearly equal in all seral stages indicating both the resiliency of these sites and their ability to produce a

large variety of plant species. Loss of the deep loess soil layer, however, will reduce site productivity and create an environment less favorable to such species diversity.

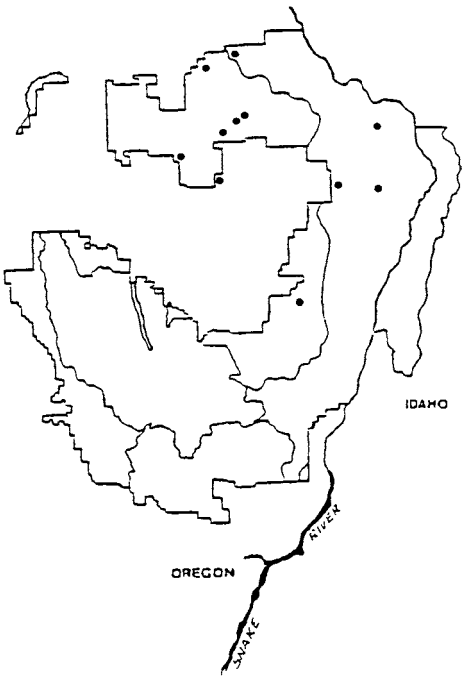
Comparison With Other Studies - The FEID-KOCR type has been described by Poulton (1955); Campbell (1962); and Tisdale (1979, 1986). The separation of the floristic type into different topographic/edaphic units has not previously been done.

"Ecology is a field science; dealing with the natural world, natural processes, and real interrelationships."

Vogl

Idaho fescue - bluebunch wheatgrass (ridgetops) plant community type
Festuca idahoensis - Agropyron spicatum
(FEID-AGSP) (ridgetops) (GB59 15)

8. Chesnimnus Creek Canyon near Boner Spring (Wallowa Valley Ranger District) *Plot 79*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA,WVRD	Parent Material: basalt bedrock
Elevation: (4750 ft.) 4000-6000 ft.	Solum depth: (10 in.) 5-14 in.
Aspect: all	Loess depth: (0 in.)
Slope (7%) 2-18%	Root conc: (7 in.) 6-9 in.
Position: ridge and plateau tops,brows	Depth to GT 35% rock frag./size: rock to surf./cobbles, gravels boulders
Other: sites intermediate between FEID-KOCR tops and scablands	Surface soil/subsoil texture: loam,silt loam/ clay loam,silty clay loam

Table of Principal Species

FEID-AGSP (ridgetops) (n = 12)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=2)	Mid Seral (n=3)	Early Seral (n=1)	Very Early Seral (n=6)	Mid-late Seral Range
Grasses						
prairie junegrass	KOCR	1/50	1/67	-	2/67	0-1
*Idaho fescue	FEID	13/100	17/100	10/100	2/67	10-25
Sandberg's bluegrass	POSA3	2/100	7/100	15/100	10/100	1-15
bluebunch wheatgrass	AGSP	17/100	11/100	25/100	29/83	3-25
onespike oatgrass	DAUN	-	6/100	-	2/67	0-15
rattlesnake brome	BRBR	1/50	1/33	-	-	0-1
Perennial Forbs						
yarrow	ACMIL	1/100	6/67	-	2/83	0-10
*silky lupine	LUSE	1/100	-	20/100	2/33	0-1
stonecrop	SELA2	1/100	1/33	1/100	7/67	0-1
yellow salsify	TRDU	-	-	1/100	1/33	
pussytoes	ANLU	-	5/67	-	1/83	0-5
hoary balsamroot	BAIN	15/50	21/67	-	12/33	0-40
dwarf yellow fleabane	ERCH	1/50	1/67	1/100	1/33	0-1
Annual Forbs						
Douglas' knotweed	PODO	3/50	3/33	-	2/83	0-3
tall annual willowweed	EPPA	1/50	-	-	1/50	0-1
common speedwell	VEAR	5/50	5/33	-	5/83	0-5
deerhorn	CLPU	1/100	1/67	-	-	0-1
blepharipappus	BLSC	1/50	1/33	-	1/50	0-1
rock		30/100	42/100	25/100	34/100	20-50
gravel		20/50	5/67	-	12/33	0-20
bare ground		3/50	12/100	25/100	16/83	0-20
moss		28/100	17/100	15/100	21/100	10-40
litter		8/100	5/100	5/100	4/100	1-15
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		220	-	-	130	60-220
Idaho fescue		170	-	-	20	0-170
other spp.		130	-	-	130	60-200
Total		520	-	-	280	260-500

* Principal Indicator Species

Vegetative Composition - This plant community type is transitional between the FEID-AGSP communities of the steep canyon slopes and the FEID-KOCR or POSA3-DAUN gentle ridgetop communities. The late seral stages of FEID-AGSP ridgetop communities contain Idaho fescue and bluebunch wheatgrass as codominants. Sandberg's bluegrass (POSA3) is present in low coverage and prairie junegrass may be present, but always in low amounts. Perennial forbs are scarce. The shallow rocky soils on these sites retard many plants, but enables hot, dry site adapted plants to occur. Most common are hoary balsamroot (BAIN), dwarf yellow fleabane (ERCH), and stonecrop (SELA2). Annuals are infrequent with deerhorn (CLPU), Douglas' knotweed (PODO), and speedwell (VEAR) the most prevalent.

With degradation, Idaho fescue tends to decline. Both bluebunch wheatgrass and Sandberg's bluegrass increase. The principal increasing perennial forb is silky lupine (LUSE). Annuals that increase with disturbance are Douglas' knotweed and common speedwell.

Distribution and Environmental Features: FEID-AGSP ridgetop communities occur on many major ridges of the dissected plateau. Occupying sites intermediate to FEID-KOCR, POSA3-DAUN, and other scabland communities, FEID-AGSP ridgetop communities normally are not very extensive and occasionally exist only as transitional borders or microsites. Elevations range from 4,000-6,000 feet (mean 4,750 feet); approximately the same zone as FEID-KOCR (ridgetops). Slopes are gentle (range: 2-18%) on these ridgetop and ridgebrow areas. Surface microrelief is usually convex to straight.

Soils: Soils are typically dark reddish brown to dark brown in color in surface layers, less than 14 inches in total depth, and formed in basalt bedrock with minor loess influence. Surface layers have loam or silt loam textures and greater than 35% rock fragments by volume. Subsoil layers have silty clay loam and clay loam textures, are very rocky (greater than 50% rock), and normally extend into bedrock fractures. Rock fragments are typically cobble-sized, although gravels and even boulders are not uncommon. Surface rock exceeds 35% total cover.

These soils may represent very degraded sites that once had the capability of supporting FEID-KOCR communities. If this is correct, then soils can be expected to vary according to the amount of soil material that has been lost or displaced compared to what is more typical in the shallowest FEID-KOCR communities on ridgetops.

Summary of Soil and Site Characteristics (all samples) - FEID-AGSP Ridgetops

Total Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
5 in. to 14 in.	6 in. to 9 in.	0	2 in. to 6 in.	stable	---	to surface	exceeds 15%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship: It is likely that FEID-AGSP ridgetops are a result of overgrazing with subsequent soil loss such that the junegrass union of plants is unable to persist in the droughtier environment. Fescue is capable of persisting on relatively thin soils as longer vernal moisture is retained and soil temperatures are moderated.

These transitional FEID-AGSP communities usually occur adjacent to thinner soil sites dominated by POSA3-DAUN, other communities too droughty for fescue, or deeper soils dominated by FEID-KOCR communities. These are usually not very extensive areas. The occurrence of significant dry rocky site plants in a fescue community is significant. Important plants capable of occupying thin soils which dessicate early in the summer season are: hoary balsamroot (BAIN), dwarf yellow daisy (ERCH), pussytoes (ANLU), and stonecrop (SELA2). Onespike oatgrass occurring with fescue is very indicative of this type; but this species combination may not occur on all sites.

Series Relationship: FEID-AGSP (ridgetops) have the following characteristics that differ from FEID-KOCR (ridgetops) in late and mid seral stages:

1. FEID and AGSP coverage is less (30% vs. 40%)
2. Surface rock is very high (37% vs. 9%) in FEID-KOCR ridgetops
3. Presence of the following species: hoary balsamroot (BAIN) and dwarf yellow fleabane (ERCH)
4. Absence of the following species: Wyeth's buckwheat (ERHE), twin arnica (ARSO), red besseya (BERU), red avens (GETR), western hawkweed (HIAL2), and other more mesic plants.

FEID-AGSP (ridgetops) differ from other FEID-AGSP types as follows:

1. lowest coverage of bluebunch wheatgrass (14%); others average 26-35%
2. Cheatgrass normally is absent; but present in other other types of FEID-AGSP plant associations.
3. Hoary balsamroot (BAIN) is specific to this type; arrowleaf balsamroot (BASA) is absent from this type.
4. Slopes are gentle - average 8% and are less than 20%; other FEID-AGSP types have steep slopes (avg = 50%)

Role of Fire: Idaho fescue is sensitive to hot burns in later summer and fall. Enhancement could be provided by cooler, lighter burns in the late winter or spring when plant moisture levels will help protect root crowns from damage. However, the vegetative cover is uneven and may deter the spread of fire in this type.

Management Considerations: Maintenance of the surface area between fescue and bluebunch wheatgrass bunches is important for persistance of the bunchgrasses - especially fescue. Trampling damage may be most severe in saturated soils early in the season resulting in compaction and/or plant upheaval. Grazing too early will deter seed formation and if continued over several seasons will impede plant vigor. Multiple heavy use of these gentle slopes by wild and domestic ungulates at the early spring period may create retrogression. The principal increaser for the type is silky lupine which is toxic when seeds and fruits are eaten in quantity by cattle, horses, or sheep. Overgrazing of the associated scabland

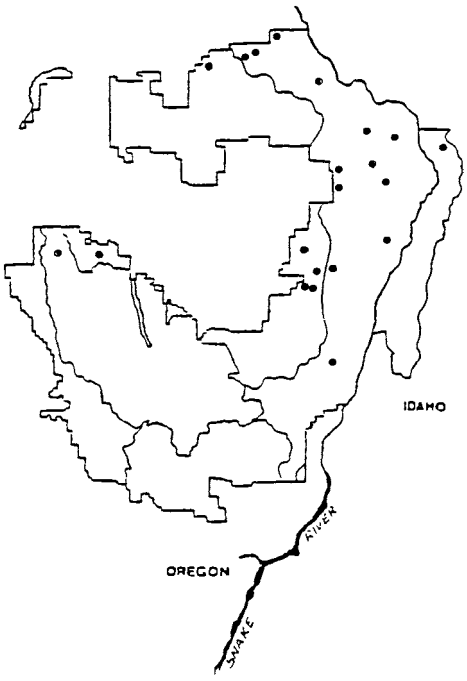
forbs may increase the likelihood of soil loss from wind and surface water erosion. These transitional communities are easily degraded with minimal use owing to their scant vegetative cover and location on wind-swept ridgetops.

Productivity: Total forage production of 500 lbs/acre (dry) in late seral communities is only slightly more than that measured in POSA3-DAUN scablands. Bluebunch wheatgrass and Idaho fescue provide most of the forage in later seral stages. Very early seral communities typically provide half as much total forage with fescue often completely absent. Sites appear to be rather fragile. Minor soil loss can reduce their potential to produce fescue and other mesic site species.

Comparison with Other Studies - See FEID-AGSP/LUSE for comparison with other FEID-AGSP studies.

Idaho fescue - bluebunch wheatgrass/silky lupine plant association
Festuca idahoensis - Agropyron spicatum/Lupinus sericeus
(FEID-AGSP/LUSE) (GB59 16)

9. Lent Butte (Wallowa Valley Ranger District) Plot 3



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: basalt colluvium + loess
Elevation: (4900 ft.) 4000-5800 ft.	Solum depth: (23 in.) 16-28 in.
Aspect: (SSE-W) SSE to WNW	Loess depth: (4 in.) 0-13 in.
Slope (50%) 30-78%	Root conc: (21 in.) 13-28 in.
Position: (mid 1/3) mid 1/3 to upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/gravels,cobbles
Other: overlaps with FEID-KOCR high at S-SW aspects above 5000 ft. elevation	Surface soil/subsoil texture: silt loam/silty clay loam, clay loam

Table of Principal Species

FEID-AGSP/LUSE (n = 21)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=5)	Mid Seral (n=9)	Early Seral (n=6)	Very Early Seral (n=1)	Late-Mid Seral Range
Shrubs						
Wyeth's buckwheat	ERHE	2/80	8/78	10/100	15/100	0-20
Grasses						
prairie junegrass	KOCR	2/60	1/67	1/17	-	0-3
*Idaho fescue	FEID	15/100	11/100	8/100	-	5-20
*Sandberg's bluegrass	POSA3	2/100	2/78	3/67	15/100	0-5
*bluebunch wheatgrass	AGSP	38/100	26/100	27/100	1/100	10-65
cheatgrass	BRTE	2/40	3/44	5/83	1/100	0-10
rattlesnake brome	BRBR	3/80	4/67	4/83	5/100	0-15
Perennial Forbs						
long leaved hawksbeard	CRAC	3/60	3/44	1/33	-	0-5
meadow death-camas	ZIVEG	1/100	1/56	1/33	-	0-3
yarrow	ACMIL	3/100	4/100	10/100	10/100	1-5
*silky lupine	LUSE	6/80	7/78	9/100	10/100	0-15
*balsamroot	BASA	2/60	5/78	3/83	25/100	0-10
*prickly lettuce	LASE	1/60	1/33	1/50	-	0-1
yellow salsify	TRDU	1/40	2/56	1/100	-	0-3
wayside gromwell	LIRU	2/40	1/33	1/50	-	0-3
nine-leaf lomatium	LOTR	2/40	2/2	1/17	-	0-3
Annual Forbs						
blepharipappus	BLSC	2/40	1/22	8/33	-	0-3
*deerhorn	CLPU	9/80	6/67	11/67	-	0-25
narrowleaved collomia	COLI2	1/20	1/33	1/50	-	0-1
Douglas' knotweed	PODO	2/40	1/33	1/17	10/100	0-3
*tall annual willowweed	EPPA	1/20	1/11	1/17	-	0-1
threadleaf phacelia	PHLI	6/60	2/56	6/67	-	0-15
common speedwell	VEAR	2/60	6/22	20/17	-	0-10
rock		15/100	15/100	23/100	5/100	2-30
gravel		12/40	7/88	5/83	40/100	0-19
bare ground		6/100	12/89	16/100	30/100	0-25
moss		29/60	9/56	5/33	5/100	0-75
litter		36/100	43/100	20/100	10/100	3-80
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		360	300	-	-	90-610
Idaho fescue		320	300	-	-	30-440
other spp.		50	240	-	-	10-400
Total		730	840	-	-	470-1040

* Principal Indicator Species

Vegetative Composition - This plant association occurs on steep canyon slopes with a more mesic assemblage of forbs associated with the principal bunchgrasses (Idaho fescue and bluebunch wheatgrass) than is found in the similar FEID-AGSP/BASA type. In late seral stages, bluebunch wheatgrass dominates over Idaho fescue (40% vs. 15%). Since FEID-KOCR high elevation communities are often present on nearby sites of more favorable growing conditions for fescue, these FEID-AGSP/LUSE communities are often reflecting the transition from the deep soil tops by containing some prairie junegrass. Sandberg's bluegrass is usually present.

Indicator species are silky lupine (LUSE), meadow death camas (ZIVEG), and long-leaved hawksbeard (CRAC). Annuals present in later seral stages are deerhorn (CLPU), speedwell (VEAR), and most commonly threadleaf phacelia (PHLI).

Degradation causes both principal bunchgrasses to decline with fescue the more sensitive. Sandberg's bluegrass tends to increase with annual bromes becoming more prominent - especially rattlesnake brome (BRBR). Perennial forbs increasing as a result of disturbance are silky lupine (LUSE), yellow salsify (TRDU), arrowleaf balsamroot (BASA), and yarrow (ACMIL). Lack of xeric site plants (i.e., hot rock penstemon, stonecrop) helps define this type in disturbance from the similar FEID-AGSP/BASA type. Deerhorn (CLPU) and blepharipappus (BLSC) are both very diagnostic annuals for lower seral stages of the FEID-AGSP/LUSE type.

Distribution and Environmental Features - The FEID-AGSP/LUSE plant association is one of the most common types and, along with FEID-AGSP/BASA, may cover the greatest number of acres of all bunchgrass associations in the Wallowa-Snake Province.

Occurring almost exclusively on Yakima basalt flows, sites include canyon and mountain slopes with well defined to partially obscured basalt rims and uninterrupted slopes with significant colluvial influence. Elevations range from 4,000 to 5,800 feet (mean: 4,900 feet); the modal elevational range of communities in the FEID series. Slopes are steep (range: 30-78%, mean: 51%) and predominately smooth to convex in microrelief. These communities occur most commonly at mid to upper third slope positions on south-southeast to west-facing sites.

Soils: Soils are typically very dark brown in color in surface layers, less than 28 inches in total depth, and formed in basalt colluvium and bedrock. They have moderate loess influence. Surface layers have silt loam textures and greater than 35% rock fragments by volume. Subsoils contain greater than 35% rock fragments, and occasionally greater than 60% by volume, especially in the deepest layers. Textures are silty clay loam or silty clay. Rock fragments tend to be gravel or cobble-sized throughout the soil layers. Surface rock usually exceeds 25% in cover.

These sites are on steep south-southeast to west-facing basalt slopes between 4,000 and 5,800 feet in elevation and have a relatively narrow range of environmental conditions.

Soils are quite uniform in FEID-AGSP/LUSE communities except where variability in accumulation of rock and loess material exists. Occasionally, soils develop in deep colluvium (greater than 60 inches) but actual solum depths are fairly shallow (less than 28 inches). Type of rock fragments depend upon the upslope source of colluvium. Also, a continuum from virtually no loess to loess influence is more typical in the FEID-KOCR (high) communities. The amount of clay concentration in subsoils may vary, but silty clay loams, silty clays, and clay loams are more common than clay textures.

Summary of Soil and Site Characteristics (all samples) - FEID-AGSP/LUSE

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
13 in. to 50 in.	5 in. to 28 in.	0 to 16 in.	5 in. to 15 in.	unstable to mod. stable	54°F to 68°F	0 to 8 in.	10% to 60%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - Annual bromes (BRTE and BRBR), silky lupine, arrowleaf balsamroot, and Sandberg's bluegrass increase in coverage from the late to mid seral stages as degradation increases. The increase of forb species in mid seral stands provides maximum diversity and better ecological stability to the community. Site productivity is usually increased over late seral, near-climax communities at mid seral stages.

Series Relationship - FEID-AGSP/LUSE communities are usually at the upper extremities of canyon slopes and therefore adjacent to AGSP-POSA3 (basalt), AGSP-POSA3/SCAN, FEID-KOCR communities, and PSME/PHMA stringer communities.

The FEID-AGSP/LUSE type usually differs from the FEID-KOCR (high) type, in late and mid seral stages as follows:

1. Rock, gravel coverage is higher in FEID-AGSP communities.

2. FEID cover is double in FEID-KOCR with AGSP cover more equal in both types.

3. BASA, CRAC, ZIVEG, and EPPA are more frequent in FEID-AGSP communities while HIAL2, GETR, SOMI, and CEAR are more common in the FEID-KOCR type.

FEID/AGSP-LUSE differs from FEID-AGSP/BASA as follows when late and mid seral communities are compared:

1. POSA3 is more abundant in FEID-AGSP/BASA (7% vs. 2%).

2. FEID-AGSP/BASA contains drier site species (i.e., LOAM, PEDE, ERLA).

3. FEID-AGSP/LUSE has higher CRAC, LIRU, LUSE composition.

4. Speedwell (VEAR) and deerhorn (CLPU) are more prevalent annuals in FEID-AGSP/LUSE.

Role of Fire - Past fires may have promoted yarrow and arrowleaf balsamroot as these common FEID-AGSP plant associates are usually undamaged by fire. Lupines, prickly lettuce, and harsh paintbrush are also not adversely affected. Fescue may be severely damaged by hot summer or autumn fires. Spring or fall burning, where adequate soil moisture protects root crowns, is recommended in order to safeguard the Idaho fescue component of this type. Basically, fire may be detrimental to the FEID-AGSP type unless the objective is to promote diversity by increasing perennial forbs and annual vegetation.

Management Considerations - The steep forb-rich slopes of FEID-AGSP are suitable for both cattle and sheep grazing, but may best be suited to the lighter, more mobile sheep -- especially when ranges are weedy to forbs. Grazing of balsamroot in spring and early summer by sheep will substantially reduce the species (Mueggler and Stewart - 1980). Elk and deer use this type extensively. When cattle also utilize the type, a potential conflict may develop as a result of fall/winter/spring use by the wild animals and summer/fall use by cattle. When the type is utilized simultaneously by winter grazing cattle and elk, damage is probable. Use of fescue and bluebunch wheatgrass during the flowering to seed-ripening stage is especially detrimental. The calendar dates for this period vary with spring seasonal variation as well as elevational seasonality within the canyonlands (i.e., a 10-day lag in plant development for each 1,000 foot elevational increase) (Hopkins 1938). Properly managed sheep grazing should tend to control both perennial weediness and reduce annual bromes.

Productivity - Total herbage production is moderate to high and may be the highest possible of all plant communities on steep slopes. Bunchgrass production is nearly equal in mid and late seral communities. Mid seral communities have significantly greater forb production than late seral communities, with total forage production slightly greater in mid seral stands.

Comparison With Other Studies - The AGSP-FEID type of Daubenmire (1970) is similar. However, in Daubenmire's study, the highest elevation plot was at 3,175 feet, compared with 5,850 feet in this study. More drier site species are therefore included in his type (i.e., prickly pear, gray rabbitbrush). Hall's (1973) "bunchgrass on deep soil, steep slopes" is similar to the FEID-AGSP/LUSE association except that it also appears to be more xeric. The earlier seral communities are dominated by cheatgrass in his type, but arrowleaf balsamroot is apparently absent as a major increaser. Tisdale's (1979, 1986) FEID-AGSP habitat type of the Snake River Canyon is similar. There is more variation in his more encompassing unit than the four FEID-AGSP associations derived in this study. Mueggler and Stewart (1980) identified a similar FEID-AGSP habitat type as the most frequently encountered grassland type in southwestern Montana. Elevations were higher (up to 7,500 feet) and as a result Stipa species were often associated.

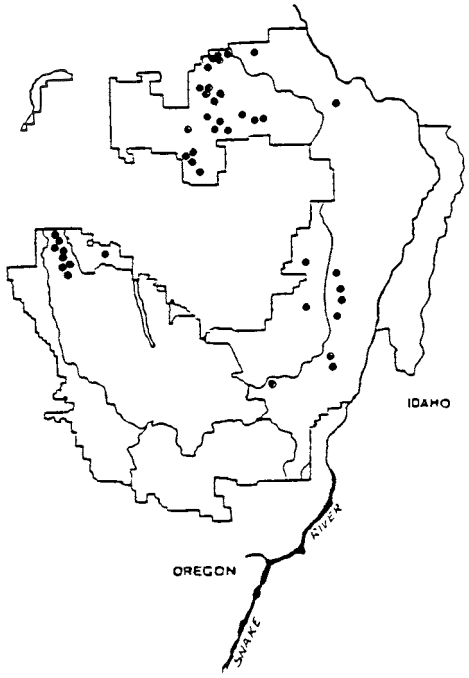
Common snowberry/Idaho fescue - bluebunch wheatgrass/silky lupine plant community type (GB51 21) (n = 8)

Steep slopes at high elevations (4,000 - 6,000 feet) of the FEID-AGSP/LUSE plant association may contain a rhizomatous low shrub composition. Shrubs usually cover about 10% of a site where moisture is retained during the summer drought period. Common snowberry (SYAL) and rose (ROSA) generally occur either together or alone with the principal bunchgrasses. Fescue is usually present at proportionately higher coverage levels to bluebunch wheatgrass than in the other FEID-AGSP plant communities. Sandberg's bluegrass is very abundant. Other commonly occurring perennial forbs are meadow death camas (ZIVEG), harsh paintbrush (CAHI2), yarrow (ACMIL), and yellow salsify (TRDU). With disturbance in these communities Wyeth's buckwheat (ERHE), arrowleaf balsamroot (BASA), silky lupine (LUSE), yarrow (ACMIL), and rattlesnake brome (BRBR) all tend to increase. The most common annual forbs are deerhorn (CLPU) and tall-annual willowweed (EPPA).

The occurrence of these communities in the canyonlands of northeastern Oregon is limited. These communities occur much higher in elevation than the shrub-dominated SYAL-ROSA communities of the mid and lower canyon elevations. Also, the shrubs are always subordinate to the dominating bunchgrasses. Daubenmire's (1970) FEID-SYAL habitat type of southeastern Washington and northern Idaho is similar in plant composition and soil features.

Idaho fescue - bluebunch wheatgrass/arrowleaf balsamroot plant association
Festuca idahoensis - Agropyron spicatum/Balsamorhiza sagittata
(FEID-AGSP/BASA) (GB59 17)

10. McAllister Ridge (Wallowa Valley Ranger District) Plot 658



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: basalt bedrock + colluvium
Elevation: (4550 ft.) 3800-6000 ft.	Solum depth: (17 in.) 9-27 in.
Aspect: (SW) E,S,SW	Loess depth: (0)
Slope (50%) 21-70%	Root conc: (16 in.) 9-27 in.
Position: (upper 1/3) mid 1/3 to upper 1/3 slopes, ridge brows	Depth to GT 35% rock frag./size: rock to surface 0-5in./cobbles gravels, stones
Other: overlaps in site with FEID-AGSP/LUSE at SW aspects between 4000-5000 ft. elev.	Surface soil/subsoil texture: loam,silt loam/clay loam, silty clay loam

Table of Principal Species

FEID-AGSP/BASA (n = 42)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=9)	Mid Seral (n=14)	Early Seral (n=10)	Very Early Seral (n=9)	Late-Mid Seral Range
Shrubs						
Wyeth's buckwheat	ERHE	2/33	6/50	2/90	5/89	0-10
Grasses						
*Idaho fescue	FEID	18/100	8/100	8/100	2/67	3-40
Sandberg's bluegrass	POSA3	10/89	6/93	4/100	3/67	0-20
bluebunch wheatgrass	AGSP	35/100	36/100	24/100	16/100	10-65
prairie junegrass	KOCR	3/33	1/71	2/20	1/22	0-3
cheatgrass	BRTE	1/11	2/43	2/30	2/44	0-3
rattlesnake brome	BRBR	2/78	4/86	10/70	15/56	0-15
Perennial Forbs						
yarrow	ACMIL	3/100	5/100	6/80	3/100	1-15
silky lupine	LUSE	2/88	1/36	8/60	4/67	1-3
*hot rock penstemon	PEDE	1/44	1/29	3/70	2/44	0-1
*arrowleaf balsamroot	BASA	9/89	6/86	16/80	16/89	0-20
stonecrop	SELA2	-	5/7	5/30	-	0-5
prickly lettuce	LASE	1/22	1/50	1/40	-	0-1
yellow salsify	TRDU	1/33	1/64	1/30	2/78	0-1
*swale desert-parsley	LOAM	2/56	1/71	1/50	10/11	0-3
meadow death-camas	ZIVEG	1/33	2/43	1/20	1/11	0-5
long leaved hawkshead	CRAC	1/11	1/36	-	1/37	0-3
eriophyllum	ERLA	-	3/29	1/20	1/22	0-10
Annual Forbs						
Douglas' knotweed	PODO	1/11	1/29	5/50	2/33	0-1
narrowleaved collomia	COLI2	1/67	2/50	2/50	1/11	0-3
thyme leaf sandwort	ARSE	1/11	-	-	4/33	0-1
*tall annual willowweed	EPPA	1/56	2/64	4/50	3/56	0-10
*deerhorn	CLPU	1/56	4/79	4/50	4/67	0-3
blepharipappus	BLSC	2/44	1/43	3/70	2/33	0-15
threadleaf phacelia	PHLI	1/22	1/36	-	-	0-1
rock		22/100	24/100	26/100	17/100	2-60
gravel		8/44	18/50	9/60	19/89	0-35
bare ground		7/100	13/100	24/100	21/100	1-40
moss		2/78	5/78	5/70	3/78	0-20
litter		31/100	26/100	12/100	16/100	3-70
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		350	390	290	145	60-500
Idaho fescue		130	80	80	0	5-190
other species		230	180	260	75	40-200
Total		710	650	630	220	390-1000

* Principal Indicator Species

Vegetative Composition - This plant association occurs on steep slopes, on the most moisture limiting sites, and at the extremes of Idaho fescue occurrence. Late seral stages always contain the principal bunchgrasses with bluebunch wheatgrass usually dominating Idaho fescue by a 2:1 ratio. Sandberg's bluegrass (POSA3) is generally present, but prairie junegrass (KOCR) is often absent. The principal perennial forb is arrowleaf balsamroot (BASA) which persists well in this drier FEID-AGSP type. Late seral stands contain up to 10% coverage by the plant.

Plant associates which help indicate the type are swale desert-parsley (LOAM) and hot rock penstemon (PEDE). Annuals are infrequent in this type with blepharipappus (BLSC), deerhorn (CLPU), tall annual willowweed (EPPA), and narrowleaved collomia (COLI2) the more prevalent.

With degeneration, all perennial bunchgrasses (FEID, AGSP, and POSA3) decline with fescue being the most sensitive. Gravel and bare ground exposure increase proportionately. The interspaces in these communities often are populated by annual bromes, especially rattlesnake brome (BRBR). Other opportunistic annuals are Douglas knotweed (PODO), thyme leaf sandwort (ARSE), tall annual willowweed (EPPA), and deerhorn (CLPU). Perennial forbs that are present in greater abundance at lower seral stages are: silky lupine, arrowleaf balsamroot, and yarrow. Presence by hot rock penstemon and stonecrops (SELA2, SEST) will help define this type in disturbance.

Distribution and Environmental Features - The FEID-AGSP/BASA type is found throughout the canyonlands of the Hells Canyon NRA and Wallowa Valley Ranger Districts. It is more common than FEID-AGSP/LUSE, and covers more acreage. The type occurs almost always on Yakima basalt flows on stable inter-rim sites or brow of ridge locations. Often the type forms mosaics with AGSP-POSA3 communities on hillsides where basalt rims have been partially obscurred. In this situation, the shallow soils with greatest rim exposure are AGSP-dominated and alternate in horizontal bands following flow boundaries with shallow to moderately deep soils that support fescue as a codominant with bluebunch wheatgrass. Erosion in the deeper soil areas is common and probably results from increased runoff from the shallower soil site above.

Elevations range from 3,800 to 6,000 feet (mean: 4,550), a slightly broader range than FEID-AGSP/LUSE sites. Slopes are moderate to steep (range, 20-70%, mean: 50%) reflecting the typical occurrence on both ridgebrow and backslope positions. Microrelief is predominantly convex to smooth, although variable, especially on complex mosaic sites. Aspects are east through west, although most typically southwest.

Soils - Soils are commonly dark brown to dark reddish brown in color in surface layers, less than 27 inches in total depth, and formed in basalt bedrock and occasionally in basalt colluvium. Loess influence is minor. Surface layers are mostly loam-textured, though silt loams are not uncommon. Rock fragments tend to be near or greater than 35% by volume. Subsoils have greater than 35% rock fragments by volume and increased clay content, especially in deeper layers. Textures are usually clay loams; less often silty clay loams. Rock fragments are cobble or gravel-sized throughout. Stones and boulders may increase with depth. Surface rock usually exceeds 25% in cover.

Soils associated with FEID-AGSP/BASA communities may vary considerably in loess content, depth, and surface texture. Since this type represents the broad transition between more xeric bluebunch wheatgrass-dominated sites and those that support fescue, a relatively wide range in site, aspect and slope steepness occurs; hence, soil variability. In general, loess influence is less than in other FEID-AGSP types. Within the type, fescue is more common where loess influence is greater. Soils at steeper mid slope positions are usually twice as deep as those found on gentler slopes (less than 40%) on upper slopes and brow of ridge positions. Soil development, as judged by clay concentration, appears the same in both situations for these bedrock-derived soils. They are inherently stable regardless of slope position. Loam textures are more common on lower elevation sites near the bluebunch wheatgrass zone while silt loam textures are more common at higher elevations nearer the FEID-KOCR (high) communities. Nevertheless, solum depth is fairly uniform with few soils exceeding 40 inches in depth.

Summary of Soil and Site Characteristics (all samples) - FEID-AGSP/BASA

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
6 in. to 39 in.	6 in. to 28 in.	---	3 in. to 21 in.	unstable to mod. stable	---	0 to 14 in.	15% to 60%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - The FEID-AGSP/BASA community approaches the lower limits of Idaho fescue relative to moisture requirements needed to maintain the species. These sites in early to very early seral stages often have compositions more like AGSP-POSA3 (basalt) communities. With continued over-utilization and preference toward fescue, a degraded FEID-AGSP can reach a condition where Idaho fescue can no longer be supported.

Plots paired at Starvation Ridge on the Wallowa Valley Ranger District demonstrate the retrogressive succession that may occur in FEID-AGSP communities. At 4,500 feet elevation, two plots were located on a gentle slope with a southwesterly aspect at a mid slope position. Although both plots were classified in early seral stages, one was bordering on very early seral. This plot contained only a trace of fescue compared to a more equitable FEID-AGSP ratio in the more successionally advanced community. Sandberg's bluegrass tended to double in coverage in the early seral community. Both sites contained the other increasers associated in early seral communities of this type (i.e., pussytoes, Douglas' knotweed). Sticky phlox (PHVI3) also showed a dramatic increase on the more seral community.

Series Relationship - FEID-AGSP/BASA communities usually occur at mid to upper canyon slope elevations where sufficient moisture is available to support Idaho fescue. Adjacent communities are often forested, AGSP-POSA3 (basalt), AGSP-POSA3/SCAN or FEID-KOCR high elevation associations.

The FEID-AGSP/BASA type differs from the FEID-KOCR (high) type in late and mid seral stages as follows:

1. Idaho fescue coverage is twice as high in FEID-KOCR (high) (25% vs. 12%); bluebunch wheatgrass coverage is greater in FEID-AGSP/BASA (35% vs 24%).

2. Rock and gravel coverage is two to three times higher in FEID-AGSP (40% vs 15%).

3. FEID-KOCR generally contains the following species which are absent in FEID-AGSP: HIAL2, SOMI, GETR, ARSO, BERU.

4. FEID-AGSP ofen contains more xeric plant members (ERLA, PEDE, LOAM).

FEID-AGSP/BASA differs from FEID-AGSP/LUSE when comparing late-mid seral sites as follows:

1. Bluebunch wheatgrass coverage is highest of any type in the FEID-AGSP group (35%).

2. Rock and gravel coverage is twice as high in FEID-AGSP/BASA communities (40% vs. 20%).

3. FEID-AGSP/BASA communities contains drier site species (LOAM, PEDE, ERLA) while FEID-AGSP/LUSE communities contain higher CRAC, LIRU, LUSE composition.

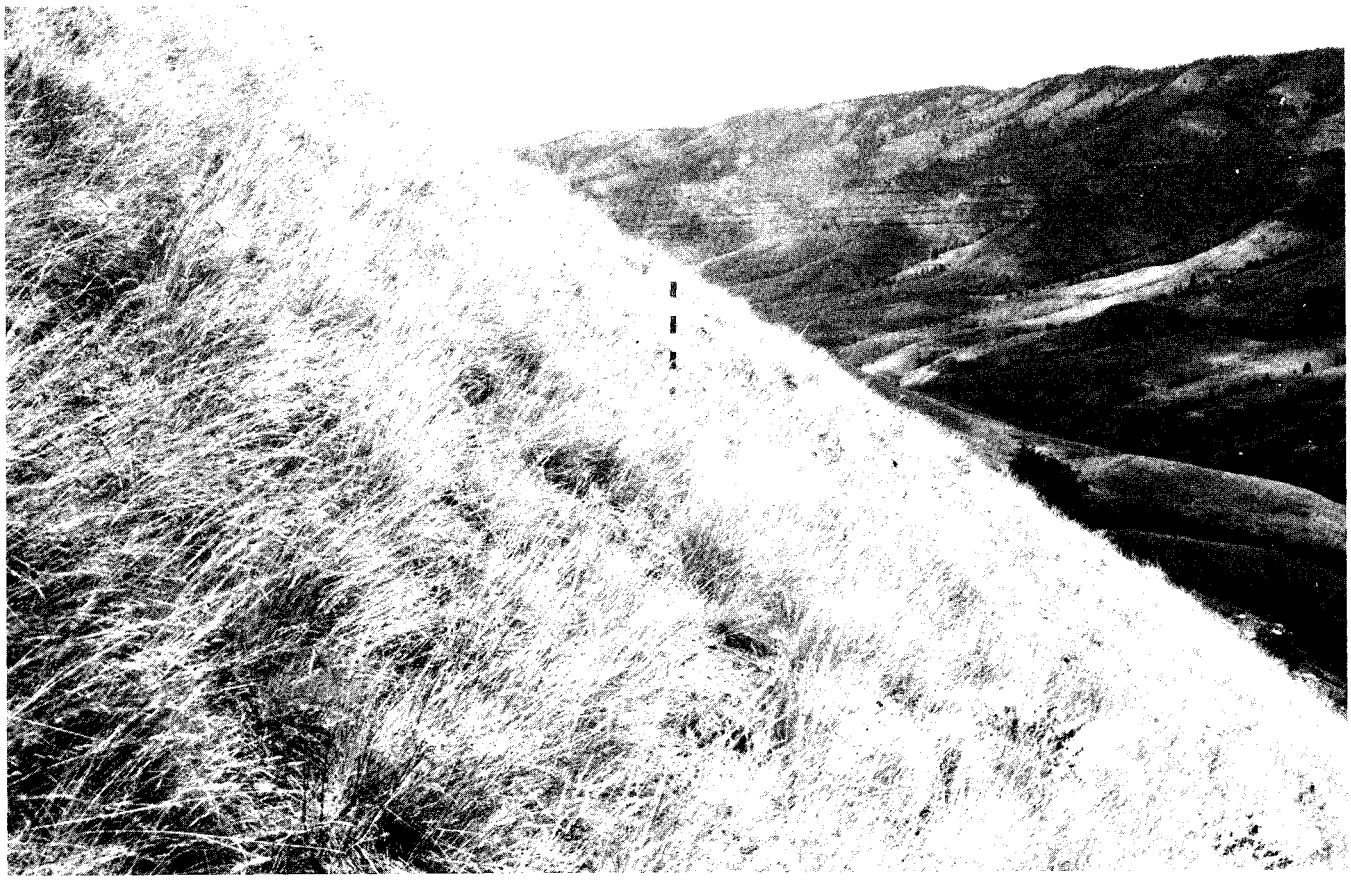
Role of Fire - Idaho fescue is damaged by hot fires in the summer and Indian summer period. Idaho fescue and bluebunch wheatgrass are enhanced only with cooler, lighter fires in the dormant season when plant moisture levels are sufficient to protect root crowns from damage. Additionally, major increasers in this type (BASA, ACMIL, LUPIN, LASE) are all promoted by fire. Use of fire in the droughtier months may damage bunchgrass vegetation and promote species diversity by increasing perennial and annual forb vegetation.

Management Considerations - Idaho fescue maintenance is the key to proper management of communities in this type. Light grazing already occurs during the critical flowering/seed set stage by wild ungulates. Additional utilization by domestic stock at this period may be detrimental to the maintenance of both FEID or AGSP. Sheep grazing of these communities in early spring has been especially detrimental to Idaho fescue due to its forage preference. Sheep grazing following seed maturity of FEID and AGSP should promote the bunchgrasses. Sheep prefer perennial forbs (ACMIL, BASA) and may promote bunchgrass establishment by trampling seed into the ground between established fescue and bluebunch wheatgrass plants. A potential conflict may develop as a result of dual use by wild ungulates and cattle on communities in this type.

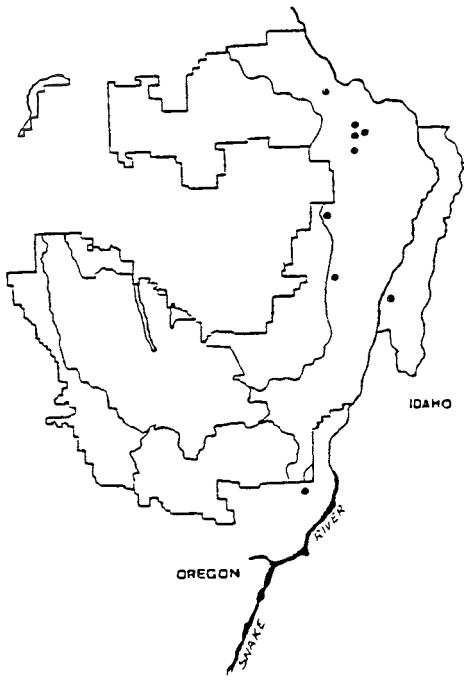
Productivity - Total herbage production is one of the lowest of all communities in the fescue series due primarily to low production of Idaho fescue. Fescue production is even less in lower seral stages and may be eliminated in very early seral stands. Although fescue and wheatgrass production may be less in early seral stands, other forage species tend to increase and thus total forage production remains nearly the same. Very early seral stands, however, show a reduction in all forage species.

Comparison With Other Studies - See AGSP-FEID/LUSE for comparison with other FEID-AGSP studies.

Idaho fescue - bluebunch wheatgrass/Snake River phlox plant association
Festuca idahoensis - Agropyron spicatum/Phlox colubrina
(FEID-AGSP/PHC02) (GB59 18)



11. Imnaha River Canyon South of Dunn Creek (Hells Canyon NRA) *Plot 977*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: basalt bedrock + colluvium some granodiorite
Elevation: (3000 ft.) 2200-3700 ft.	Solum depth: (21 in.) 20-22 in.
Aspect: E and W	Loess depth: (3 in.) 0-12 in.
Slope (63%) 55-70%	Root conc: (11 in.) 6-16 in.
Position: (mid 1/3) lower to upper 1/3 slopes tops	Depth to GT 35% rock frag./size: (11 in.) 6-16 in./gravels,cobbles
Other: reflects low elevation transition from FEID-KOCR to AGSP sites	Surface soil/subsoil texture: silty clay loam,silt loam /clay loam

Table of Principal Species

FEID-AGSP/PHCO2 (n = 9)

Species	Code	Mean Foliar Cov(%)/Con(%) Late Seral (n=4)	Mid Seral (n=5)	Late-mid Seral Range
Grasses				
*Idaho fescue	FEID	15/100	11/100	1-30
*Sandberg's bluegrass	POSA3	5/50	3/80	0-5
*bluebunch wheatgrass	AGSP	23/100	28/100	15-40
cheatgrass	BRTE	1/50	7/40	0-10
rattlesnake brome	BRBR	1/50	1/20	0-1
Perennial Forbs				
yarrow	ACMIL	2/100	3/100	1-5
*silky lupine	LUSE	5/25	4/60	0-10
*balsamroot	BASA	2/50	8/100	0-20
yellow salsify	TRDU	1/50	1/20	0-1
wild hyacinth	BRDO	1/50	1/20	0-1
*long-leaved hawksbeard	CRAC	1/75	1/20	0-1
woodsia	WOOR	1/50	1/40	0-1
large-fruited lomatium	LOMA	1/75	1/40	0-1
*Snake River phlox	PHCO2	1/50	1/80	0-1
*shaggy fleabane	ERPU	1/50	1/40	0-1
rock		16/100	32/100	3-60
gravel		7/75	13/60	0-15
bare ground		3/100	9/100	1-15
moss		39/100	8/80	0-60
litter		25/100	24/100	1-60
Herbage Production (lbs/acre dry wt.)				
bluebunch wheatgrass		380	250	270-480
Idaho fescue		180	140	140-220
other species		80	360	40-360
Total		640	750	600-750

* Principal Indicator Species

Vegetative Composition - Communities pertaining to this plant association occur at the lower elevational limits of Idaho fescue in the canyonlands and are identified by a lack of prairie junegrass, a stoney soil surface, and a group of dry site forbs that are associated with the principal bunchgrasses. Bluebunch wheatgrass dominates over Idaho fescue with Sandberg's bluegrass usually associated in later seral stands. Forbs are usually scant with annual forbs essentially absent. Snake River plhox (PHOC2), long-leaved hawksbeard (CRAC), arrowleaf balsamroot (BASA), and shaggy fleabane (ERPU) all tend to define this type.

With disturbance, the principal interstitial increaser is cheatgrass (BRTE). Idaho fescue, the most sensitive of the perennial bunchgrasses, declines. Perennial forbs tending to increase are yarrow (ACMIL), silky lupine (LUSE), and arrowleaf balsamroot (BASA).

Distribution and Environmental Feature - Communities in the FEID-AGSP/PHCO2 type occur in the deep canyons of the Snake and Imnaha River drainages and represent the low elevation transition between FEID-KOCR communities and communities in the bluebunch wheatgrass series. Elevations range from 2,200 to 3,700 feet (mean: 3,000 feet), the lowest extension of FEID-AGSP communities in this area. Slopes are very steep, ranging from 55 to 70% on east and west-facing canyonsides. Slope position is usually mid third, although lower third positions are also common. Surface microrelief is convex to occasionally concave.

Soils - Soils are typically dark brown in color in surface layers, less than 24 inches in depth and formed in loess and basalt colluvium or basalt bedrock. Surface layers have silty clay loam textures and less than 35% rock fragments. Subsoils are clay loams with at least 35% rock fragments. In all layers, rock fragments are gravel and cobble-sized.

Although this type represents the FEID-KOCR to AGSP/POSA3 transition, soils do not vary greatly. Loess influence is the most variable, however, and tends to be less on more exposed locations. Unlike some sites supporting other members of the fescue series, soils are not predominantly loess influenced and do not have silt loam or loam textures in surface horizons, but are more clayey. The increased water holding capacity of clay on these soils and less rock in surface layers apparently compensates for decreased precipitation at lower elevations, thus allowing these sites to support fescue.

Summary of Soil and Site Characteristics (all samples) - FEID-AGSP/PHCO2

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
20 in. to 40 in.	8 in. to 40 in.	0 to 25 in.	12 in. to 14 in.	stable	53°F to 64°F	6 to 40 in.	10 to 60%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - Idaho fescue persists at these lower elevations due to a tenuous relationship achieved through aspect, subsurface moisture availability, and surface insulation properties by moss, lichen, litter, and other plant cover. Early and very early seral conditions are not characterized in this study for this type. It is anticipated that very early seral stands would contain relict fescue, declining bluebunch wheatgrass abundance, and increased amounts of cheatgrass, yarrow, and balsamroot. Perhaps red three awn becomes more important in highly disturbed communities pertaining to this type.

Interestingly, annual forbs are very scarce in FEID-AGSP/PHCO2. Most of the annuals occurring in other FEID-AGSP types are present, but in trace amounts. Prickly lettuce (LASE) and cleavers (GAAP) show the greatest probability of increasing with serious degrading of these communities.

Series Relationship - Communities of this type are often found adjacent to FEID-KOCR low elevation communities, AGSP-POSA3 types, or dry canyonland shrub-dominated communities.

FEID-AGSP/PHCO2 can be differentiated from FEID-KOCR (low) in mid to late seral stages as follows:

1. Prairie junegrass is absent.

2. Idaho fescue is much less abundant (13% vs. 41%).

3. Shaggy fleabane (ERPU) and hawksbeard (CRAC) are commonly found in FEID-AGSP/PHCO2 while FEID-KOCR/low elevation communities contain junegrass union indicators (i.e., ARSO, BERU, SOMI, HIAL2, FRAL2).

4. Rock/gravel cover is much greater (30% VS. 5%).

FEID-AGSP/PHCO2 is defined from other FEID-AGSP types in mid to late seral stage as follows:

1. Shaggy fleabane and Snake River phlox are restricted to this type.

2. Appreciable lack of annual forbs whereas other FEID-AGSP types have the following present in late seral stages: CLPU, EPPA, LERA.

3. Wyeth's buckwheat tends to be present in other FEID-AGSP steep slope communities, but is absent from FEID-AGSP/PHCO2.

4. Moss coverage is highest for the FEID-AGSP types (26%); less than 20% in others.

Role of Fire - Past fires may have promoted yarrow and arrowleaf balsamroot as these common FEID-AGSP plant associates are usually undamaged by fire. Lupines, prickly lettuce, and harsh paintbrush are not adversely affected. Idaho fescue may be severely damaged by hot summer or autumn fires. Spring or fall burning, where adequate soil moisture protects root crowns, is recommended in order to safeguard the fescue component of this type. Basically, fire may be detrimental to the FEID-AGSP type unless the objective is to promote diversity by increasing perennial forbs and annual vegetation.

Management Considerations - The steep forb-rich slopes of FEID-AGSP/PHCO2 are suitable for both cattle and sheep grazing, but may best be suited to the lighter, more mobile sheep -- especially when ranges are weedy to forbs. Grazing of balsamroot in spring and early summer by sheep will substantially reduce the species (Mueggler and Stewart - 1980). Elk and deer use this type extensively. When cattle also utilize the type, a potential conflict may develop as a result of fall/winter/spring use by the wild ungulates and summer/fall use by cattle. When the type is utilized simultaneously by winter grazing cattle and elk, damage is probable. Use of Idaho fescue and bluebunch wheatgrass during the flowering to seed-ripening stage is especially detrimental. The calendar dates for this period vary with spring seasonal variation as well as elevational seasonality within the canyonlands (i.e., a 10-day lag in plant development for each 1,000 foot elevational increase) (Hopkins 1938). Properly controlled sheep grazing should tend to control both perennial weediness (i.e., arrowleaf balsamroot, yarrow) and eliminate annual bromes.

Productivity - Total forage production is about equal to that capable in FEID-AGSP/BASA communities, but less than in FEID-AGSP/LUSE. Fescue and wheatgrass production is also intermediate in comparison to the other FEID-AGSP communities found on steep slopes. Within the type, forb species tend to produce more herbage in earlier seral stages as fescue and wheatgrass decline.

Comparison With Other Studies - See FEID-AGSP/LUSE for comparison with other FEID-AGSP studies.

"Imagination is more important than intelligence."

Vogl

Idaho fescue - timber oatgrass - sedge plant association
Festuca idahoensis - Danthonia intermedia - Carex spp.
(FEID-DAIN-CAREX) (GB59 20) (n = 4)

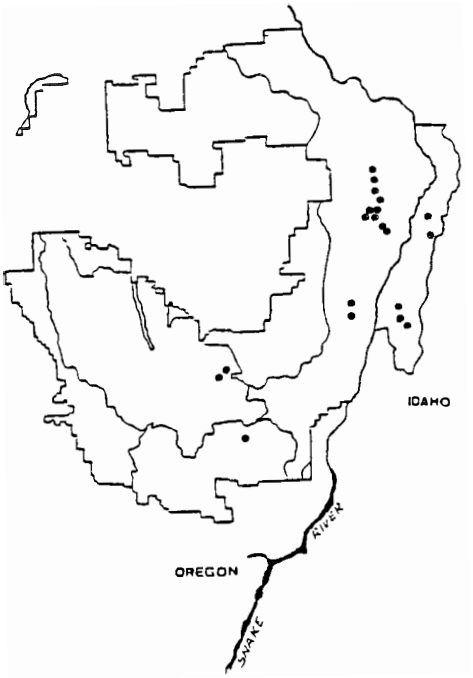
This plant community represents the wetter end of the typical Idaho fescue-junegrass (FEID-KOCR) plant association. Occupying moderately deep to deep silt loam soils on the dissected plateau ridges of Hells Canyon NRA (i.e., Sleepy and Windy in Oregon; Cold Springs in Idaho), timber oatgrass (DAIN) stands are frequently associated with the more extensive FEID-KOCR type. Stands with 15-25% oatgrass are common. The oatgrass occurs in small patches or as a fairly continuous scattering across the fescue-sedge stand. Many of the ridgetops where the type occurs have received heavy grazing use and plots established in this type are mostly in early seral stages. These sites are low in fescue, have increasing oatgrass and sedges (CAHO, CAPE) and show invasion by Kentucky bluegrass (POPR), needlegrass (STOC), gumweed (GRNA), tarweed (MAGL), and dandelion (TAOF). Other forb associates found include: lupine, red avens (GETR), paintbrush (CACU3), aster (ASIN), yarrow (ACMIL), pussytoes, and phlox.

Sampled stands in Oregon occurred on gentle slopes (less than 10%) above 6,000 feet in elevation on the summits of major non-forested, undulating, broad ridgetops. In Idaho above 7,500 feet in elevation, communities of FEID-DAIN-CAREX often occurred on steep mountain side-slopes with skyline bluegrass (POCUE), glandular cinquefoil (POARC), rosy pussytoes (ANRO), and yellow buckwheat (ERFL). Weediness at these elevations was reflected by high frequency and foliar cover of yarrow (ACMIL), needlegrass (STOC), and Hood's sedge (CAHO). A relatively high cover (5%) of ballhead sandwort (ARCO2) was especially noteworthy. Forage production on two sampled plots ranged from 600 to 1,000 lbs/acre (dry wt.) with FEID supplying nearly half of the total.

The Carex hoodii/Festuca idahoensis habitat type described by Tisdale (1986) in the Snake River grasslands of Idaho is very similar to the FEID-DAIN-CAREX plant association. The frequency of Hood's sedge, many ribbed sedge, timber oatgrass, capitate sandwort, and pussytoes with Idaho fescue is very similar to the high constancies of these species found in FEID-DAIN-CAREX. Liddon's sedge (CAPE) is an indicator plant for FEID-DAIN-CAREX, but was not listed in Tisdale's CAHO/FIED habitat type however. The FEID-CAHO plant association, so prevalent in Oregon on the dissected plateaus, is dissimilar to the CAHO/FEID habitat type since it does not contain timber oatgrass, capitate sandwort, or pussytoes.

Idaho fescue - Hood's sedge plant association
Festuca idahoensis - Carex hoodii (FEID-CAHO) (GB59 21)

12. Horse Heaven, Seven Devils (Hells Canyon NRA) *Plot 7011*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA, WVRD	Parent Material: loess + basalt or granodiorite
Elevation: (6600 ft.) 6000-8000 ft.	Solum depth: (45 in.) 35-60 in.
Aspect: (SW) all	Loess depth: (19 in.) 15-22 in.
Slope (15%) 3-55%	Root conc: (20 in.) 18-22 in.
Position: (ridgetops) ridgetops and montane slopes	Depth to GT 35% rock frag./size: (27 in.) 22-23 in./gravels, cobbles
Other: represents highest elevation extension of Idaho fescue sites	Surface soil/subsoil texture: silt loam,loam/ clay loam

Table of Principal Species

FEID-CAHO (n = 20)

Species	Code	Mean Foliar Cov(%)/Cons(%) Late Seral (n=2)	Mid Seral (n=2)	Early Seral (n=1)	V.Early Seral (n=15)
*Idaho fescue	FEID	45/100	17/100	10/100	
mountain brome	BRCA	-	3/50	10/100	11/73
*Hood's sedge	CAHO	9/100	2/100	45/100	33/87
lupine spp.	LUPIN	25/50	12/100	15/100	7/40
penstemon spp.	PENST	3/100	-	1/100	8/47
yarrow	ACMIL	8/100	8/100	10/100	9/73
false dandelion	AGOSE	1/50	-	-	3/67
aster spp.	ASTER	3/100	20/50	1/100	16/67
blueleaf strawberry	FRVI	-	-	-	11/60
cluster tarweed	MAGL	-	-	-	6/40
rock		1/50	1/50	3/100	2/60
gravel/pavement		8/100	8/100	5/100	5/20
bareground		5/100	8/100	1/100	20/93
moss		1/50	-	-	12/40
litter		12/100	1/100	1/100	43/100

Herbage Production (lbs/acre dry wt.)

Idaho fescue	340	not	0	not
other graminoid spp.	40	sampled	360	sampled
other forage spp.	470		110	
Total	850		470	

* Principal Indicator Species

Vegetative Composition - The high elevation ridgetops of the dissected plateau in Oregon and sub-alpine ridge crests of the Seven Devils are characterized by a fescue-sedge plant community dominated by Idaho fescue in association with Hood's sedge. Yarrow (ACMIL), lupines (LUSE, LUCA), aster (ASIN), penstemon (PEGL4), and buckwheats (ERFL, ERHE) usually occur in these grass-sedge communities.

Due to past over-grazing by domestic sheep in the early years of this century the broad dissected plateau ridgetops are generally in very early seral stages. Degeneration has resulted in decreased fescue with increasing sedge. In the best condition, Idaho fescue dominates Hood's sedge in a 4:1 ratio. This relationship is reversed in early seral stands and by very early seral stages the loss of fescue is complete.

In addition, Kentucky bluegrass (POPR) has invaded some sites. With total eradication of the fescue component, other invasion species such as tarweed (MAGL) often enter the stands while Hood's sedge increases markedly. Other plants frequently occurring in weedy fashion on very early seral sites in the absence of fescue are: needlegrass (STOC), false dandelion (AGOSE), strawberry (FRVI), lupine (LUCA, LUSE), aster (ASIN), and penstemon (PEGL4).

On very early seral FEID-CAHO sites, domination may be characterized by bare ground with false dandelion (AGGL), penstemon (PENST), strawberry (FRVI), yarrow (ACMIL), tarweed (MAGL), pussytoes (ANLU), and dandelion (TAOF) frequently providing the only vegetative cover. Mountain brome increases noticeably in early seral stands where fescue is less competitive. Hood's sedge (CAHO), mountain brome (BRCA) and relict exotics (PHPR, AGIN2) are sometimes present in early seral communities of this type where past re-seeding efforts have been undertaken.

Distribution and Environmental Features - FEID-CAHO communities are found in the Hells Canyon NRA ranging from 6,000 to 8,000 feet in elevation along the broad dissected plateau ridgetops in Oregon and up to 8,000 feet on montane sideslopes in the Seven Devils and Wallowa Mountains. Slopes averaged 30% in the montane sites at higher elevations, but were much more gentle (average 7%) on FEID-CAHO sites of the Oregon dissected plateau. Aspects of the steeper slopes were southwesterly.

Soils and Productivity - Soils are less than 60 inches deep and formed in a mix of loess and basalt or granodiorite rock. Surface layers have silt loam textures and less than 35% rock fragments. Subsoil layers are usually clayey and have greater than 35% rock fragments by volume. Total forage production on two sampled communities in Idaho was approximately 800 lbs/acre (dry wt.). Idaho fescue or sedges made up the majority of the forage produced.

Management Considerations - The gentle topography of dissected plateau ridgetops in Oregon provides reseeding opportunities for rehabilitation of FEID-CAHO sites in early and very early seral stages. The friable silt loam to very fine sandy loam soils are moderately deep and could be easily worked, but climatic extremes due to high elevations often limit the period of revegetation activity to July and August. The allelopathic response from tarweed is also a significant problem to seedling establishment (Carnahan & Hall - 1961).

Some results of reseeding in the FEID-CAHO type can be observed in Oregon. Extensive areas of the Bald-Sleepy Allotment (south of a line between Monument Ridge and Sour Apple Flat) have been heavily abused by domestic sheep and were devoid of perennial vegetation before reseeding in the 1950's (Wade Hall, personal communication). Areas where the reseeding failed to establish or which were subsequently overgrazed now contain only relict introduced species with a heavy tarweed-dominated community. Gopher activity is especially high. Two exotic grass species appear to have performed well in these degenerated communities. Tall oatgrass (AREL) is prolific on some wetter sites. Cattle graze it to low stubble in late summer after seeking out more preferred grasses. Probably the most impressive seeding on these FEID-CAHO sites is hard fescue (Festuca ovina) which occupies some parts of the allotment to the exclusion of other plants.

Idaho fescue-elk sedge plant community type
Festuca idahoensis - Carex geyeri
(FEID-CAGE) (GB59 22) (n = 1)

Inter-forest clearings on high elevation (7,000 feet) steep mountain sideslopes of the Seven Devils may contain very productive grass-sedge communities dominated by elk sedge and Idaho fescue. Penstemon (PEGL2), aster (ASIN), and lupine (LUCA) are very abundant from probable sheep overgrazing. Although elk sedge is encountered infrequently with fescue (except in ARTRV/CAGE) the FEID-CAGE community is an excellent producer of forage in an area lacking palatable forage within forested stands and scree slopes.

Bluebunch Wheatgrass Series

1a. Wyeth's buckwheat (ERHE) present; oniongrass (MEBU), Blue Mountain penstemon (PEVE), and pine bluegrass (POSC) are generally associated . . . . . AGSP/ERHE . (p. 87)

1b. Not as above 2

2a. Bluebunch wheatgrass present on shallow soils (less than 11 inches) 3

3a. Bluebunch wheatgrass occurs on scablands (slopes less than 15%) and basaltic substrates with typical scabland plants associated (i.e., hoary balsamroot (BAIN), sticky phlox (PHVI3), dwarf yellow fleabane (ERCH) . . . . . AGSP-POSA3 scabland . (p. 134)

3b. Bluebunch wheatgrass occurs on steep slopes (greater than 30%), varying substrates, with prickly pear always present . . . . . AGSP-POSA3/OPPO . . . (p. 121)

2b. Bluebunch wheatgrass present on deeper soils (greater than 11 inches) or slopes greater than 15% or substrates non-basaltic 4

4a. Substrates are granitic (usually quartz diorites); gravels cover less than 15% of the soil surface and moss covers greater than 10% of the soil surface. Large fruited lomatium (LOMA), hairy milkvetch (ASIN2), and prickly pear (OPPO) are commonly associated . . . . . AGSP/POSA (granite) (p. 111)

4b. Substrates are non-granitic 5

5a. Substrates are metavolcanics of Snake River Canyon 6

6a. Associated forb coverage is high. Arrow-leaf balsamroot (BASA), cryptantha (CRIN2), Cusick's milkvetch (ASCU4) commonly associated. Elevations are generally above 2,500 feet . . . . . AGSP-POSA3/ASCU4 (p. 102)

6b. Associated forb coverage is low. Drier site species are common - shaggy fleabane (ERPU), thistles (CIRSIUM), varileaf phacelia (PHHE), and prickly pear (OPPO). Elevations are generally 2,500 feet and below. . . . . AGSP-POSA3/ERPU (p. 107)

5b. Substrates are basaltic or sedimentary 7

7a. Red three awn (ARLO3) and/or sand dropseed (SPCR) associated with bluebunch wheatgrass (AGSP) on terraces and benchlands . . . . . .AGSP-SPCR-ARLO3 (p. 126)

7b. Not as above 8

8a. Species composition dominated by the following forbs: Snake River phlox (PHCO2), hairy golden aster, (CHVI2), prickly pear (OPPO), and shaggy daisy (ERPU). Indian wheat (PLPA) and sleepy cat (SIAN2) frequently found in the interspaces between plants . . . . . AGSP-POSA3/PHCO2 (p. 116)

8b. Species composition not as above . . 9

9a. Narrow leaved skullcap (SCAN) present; other shifting colluvial site plants usually associated are common eriophyllum (ERLA), and sleepy cat (SIAN2). Coarse fragments (gravel, erosion pavement, and rock) usually cover greater than 50% of the soil surface. . . . . AGSP-POSA3/SCAN (p. 92)

9b. Narrow leaved skullcap (SCAN) is absent and other forbs are usually infrequent. Silky lupine (LUSE), narrow-leaved collomia (COLI2), and tall annual willowweed (EPPA) are commonly associated. Coarse fragments generally cover less than 50% of the soil surface. . . . . AGSP-POSA3 (basalt) (p. 97)

BLUEBUNCH WHEATGRASS (AGSP) SERIES

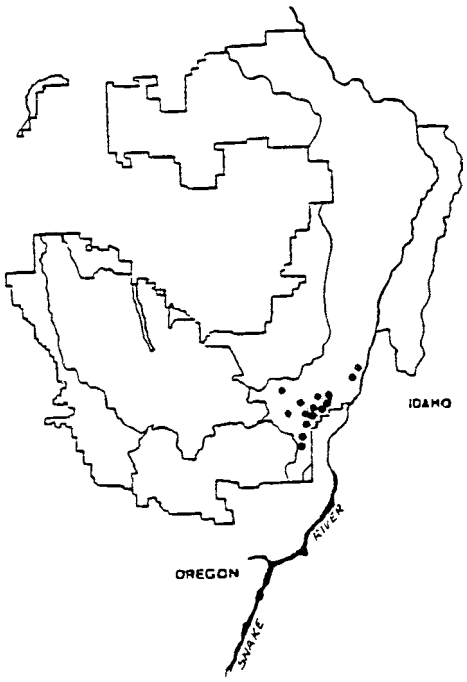
Summary of Plant Association and Community Type Characteristics 1/

Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	Principal Increasers/ Invaders	(3) Forage (lbs./acre) dry
AGSP/ERHE	4300-5600 (4800)	mid to upper slope	SE-SW	30-65% (55%)	basalt	16-40 (20) 8-20 (13)	AGSP,ERHE POSC,MEBU	BASA,LUCA/ PEVE,	(420) 260-625
AGSP-POSA3/ SCAN	2850-4450 (3600)	lower to upper slope	S-SSW	35-74% (56%)	basalt	7-31 (18) 7-25 (15)	AGSP,POSA3 SCAN	ACMIL,LODIE/ EPPA,PHLI	(385) 120-590
AGSP-POSA3 basalt	3500-4900 (4100)	mid to upper slope	E-SW	30-70% (55%)	basalt	13-29 (26) 5-32 (17)	AGSP,POSA3 LUSE,COLI2	EPPA,CLPU/ ANNUAL BROMES	(685) 410-890
AGSP-POSA3/ ASCU4	2500-3700 (3000)	mid to upper slope	E-W	35-80% (56%)	Loess + metavolcanic colluvium	40-60 (52) 13-20 (17)	AGSP,POSA3 ASCU4,BASA	BASA,OPPO/ BRTE,MYMI	(420) 410-550
AGSP-POSA3/ ERPU	1500-2600 (2000)	lower to mid slope	SE-WNW	30-65% (57%)	various	30-43 (36) 10-35 (22)	AGSP,POSA3 ERPU,PHHE	SCAN,OPPO/ BRTE,FEME	(665) 500-800
AGSP-POSA3 granite	1300-3000 (2000)	benches to upper slope	E-W	7-68% (45%)	granodiorite	8-20 (14) 7-15 (9)	AGSP,POSA3 OPPO,LOMA	BASA,OPPO/ ARLO3,SPCR	(550) 340-800
AGSP-POSA3/ PHCO2	1300-3100 (2500)	mid to upper slope	E-W	15-65% (43%)	Loess + basalt colluvium	20-33 (26) 19-34 (25)	AGSP,POSA3 PHCO2,ASIN2	OPPO,SCAN/ SPCR	(860) 430-1025
AGSP-POSA3/ OPPO	1800-3700 (2600)	mid to upper slope	S	30-75% (50%)	basalt metavolcanic sedimentary	6-8 (7) 4-8 (6))	AGSP,POSA3 OPPO,ERPU	ASPUG,ASIN2/ BROMES,PLPA	(380) 200-680
AGSP-SPCR-ARLO3	1200-2500 (2000)	lower slope benches, terraces	all	1-30% (14%)	Loess + colluvium, alluvium	30-60 (42) 20-55 (32)	AGSP,POSA3 ARLO3-SPCR	ERPU,OPPO/ ARLO3,SPCR	(655) 625-690

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Forage production in mid and late seral communities

Bluebunch wheatgrass/Wyeth's buckwheat plant association
Agropyron spicatum/Eriogonum heracleoides
(AGSP/ERHE) (GB41 11)

13. Blackhorse Ridge (Hells Canyon NRA) *Plot 863*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: basalt bedrock + colluvium
Elevation: (4800 ft.) 4300-5600 ft.	Solum depth: (20 in.) 16-40 in.
Aspect: (SE to SW) E to W	Loess depth: (0)
Slope (55%) 30-65%	Root conc: (13 in.) 8-20 in.
Position: mid 1/3 to upper 1/3 slopes	Depth to GT 35% rock frag./size: (6 in.) 0-11 in./gravels,cobbles
Other: highest elevation extension of bluebunch wheatgrass types; centers in N.Pine Cr. vincinity	Surface soil/subsoil texture: silt loam, loam,silty clay loam/silty clay loam,clay loam, clay

Table of Principal Species

AGSP/ERHE (n = 15)

Species	Code	Mean Foliar Coverage (%)/Constancy (%) Late Seral (n=4)	Mid Seral (n=8)	Early Seral (n=3)	Late to Mid Seral Range
Shrubs					
*Wyeth's buckwheat	ERHE	10/100	13/100	22/100	0-30
sulfur buckwheat	ERUM	8/50	1/50	1/33	0-10
Grasses					
*bluebunch wheatgrass	AGSP	28/100	24/100	23/100	15-35
*pine bluegrass	POSC	1/75	1/75	1/33	0-5
*oniongrass	MEBU	2/50	3/75	2/33	0-5
Perennial Forbs					
yarrow	ACMIL	5/100	6/100	10/100	1-15
lupine spp.	LUPIN	3/75	4/63	7/100	0-10
fern-leaved lomatium	LODIE	-	3/75	1/67	0-10
arrowleaf balsamroot	BASA	10/25	13/100	17/100	0-25
white stemmed frasera	FRAL2	13/50	1/13	15/33	0-15
*Blue Mountain penstemon	PEVE	6/50	2/63	11/67	0-10
harsh paintbrush	CAHI2	1/25	4/50	1/33	0-10
Annual Forbs					
Douglas' knotweed	PODO	3/50	4/88	15/33	0-15
tall annual willowweed	EPPA	1/50	1/38	1/33	0-1
rock		26/100	17/100	14/67	1-65
gravel/pavement		19/100	24/100	15/100	10-50
bare ground		5/100	20/100	14/100	1-35
litter		20/100	14/100	15/100	5-30
Herbage Production - (lbs/acre dry wt.)					
bluebunch wheatgrass		210	205	-	100-330
other forage species		235	215	-	40-220
Total		445	420	-	260-625

* Principal Indicator Species

Vegetative Composition - This type characterizes the highest elevational extension of communities in the bluebunch wheatgrass series. It occurs in the Idaho fescue zone, but on soils having minor loess influence. The AGSP/ERHE type is dominated in late and mid seral stages by bluebunch wheatgrass and Wyeth's buckwheat (ERHE) on steep canyon slopes. Sandberg's bluegrass is largely replaced by two grasses not generally found in the other grassland vegetation of Hells Canyon NRA -- pine bluegrass (POSC) and oniongrass (MEBU). This type has an appearance of bunchgrasses with buckwheat clumps and forb-free interspaces. Perennial forbs are few with yarrow (ACMIL), white-stemmed frasera (FRAL2), Blue Mountain penstemon (PEVE), and lupine (LUCA) most frequently encountered. Bare ground, gravel, and rock averaged almost 50% in late seral communities.

With ungulate degradation of AGSP/ERHE communities, bluebunch wheatgrass declines in cover; pine bluegrass, bare ground, and Wyeth's buckwheat increase in cover. Perennial forbs tending to increase are balsamroot, tailcup lupine, and yarrow. Balsamroot is the principal increasing forb. Blue Mountain penstemon is very showy on degraded rangelands in AGSP/ERHE and can provide indicator assistance in defining this plant association. Annual grasses do not occur in the AGSP/ERHE communities in any seral stage!! The annual forb, Douglas' knotweed (PODO), is more frequently found between the bunches than any other annual plant in the bluebunch wheatgrass-dominated grasslands.

Because of their proximity to adjacent forested stands, a scattering of some other shrubs often exists within these communities (i.e., spiraea (SPBE), snowberries (SYOR, SYAL), sulfur buckwheat (ERUM), and Oregon-grape (BERE)).

Distribution and Environmental Features - The AGSP/ERHE plant association is apparently centered in the Dry Creek-North Pine Creek-Gumboot Creek vicinity of Hells Canyon NRA. This is the same general area defining the range of Cusick's camas (CACU). Elevations range from 4,300 to 5,000 feet (mean: 4,300), the highest mean elevation of all communities in the bluebunch wheatgrass series. Overlap with the AGSP-POSA3 basalt type occurs between 4,300 and 4,900 feet and with the AGSP-POSA3/SCAN type between 4,300 and 4,500 feet in elevation. Sites are confined to Yakima basalt flows in areas typically with strong bedrock control over the distribution of the AGSP/EREH communities. Such areas often are part of a forest/non-forest horizontal stringer community complex where bands of trees alternate with bands of bunchgrass communities. Sites are found on moderately steep to steep (range 30-65, mean 55%) southeast-to-southwest facing inter-rims of convex to slightly undulating micro-relief at mid to upper third slope positions. This type has one of the highest covers of rock and lowest covers of moss of all bluebunch wheatgrass-dominated plant associations.

Soils - Soils are typically dark brown to dark reddish brown in surface layers, less than 40 inches in total depth, and formed in basalt bedrock and colluvium with minor loess influence. Surface layers have silt loam, loam, or silty clay loam textures and greater than 15% to greater than 35% rock fragments by volume. Subsoils have greater than 35% rock fragments. Clay increases with depth as indicated by the clay loam or clay textures. Gravel and cobble-sized rock fragments are most common in surface layers. Subsoils show increased cobble and stone-sized material. Surface rock normally exceeds 50% total cover.

Past erosion probably has been a major process in determining the character of some sites occupied by AGSP/ERHE communities. For this reason, soils tend to vary in regard to depth, color, clay content, and texture. Deeper soils may be formed where more colluvium is mixed over time with material developed in place, or where less erosion has occurred. The reddish color of soils on steeper slopes may be due to erosion exposing the once buried clay layers and to the slightly reddish nature of the parent rock. Surface soil textures appear to vary according to the amount of loess influence as well as the degree of past erosion. While solum depth is approximately the average for bluebunch wheatgrass sites, the presence of silt loams in surface layers is fairly unique.

Summary of Soil and Site Characteristics (all samples) - AGSP-ERHE

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
8 in. to 40 in.	4 in. to 27 in.	0	3 in. to 16 in.	un- stable	54°F to 70°F	0 to 14 in.	30% to 65%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - The AGSP/ERHE plant association is singular in that annual bromes are completely absent from a bluebunch wheatgrass type. Daubenmire (1970) relates that sheep use can be so heavy as to completely eliminate annual bromes from a site. Domestic sheep have historically used these AGSP/ERHE communities at a period of early summer when the annual grasses, bunchgrasses (AGSP, POSA3), and perennial forbs are especially vulnerable to grazing damage. The lack of frequent perennial forb composition may attest to their selective exclusion by domestic sheep use. The fact that no relict Idaho fescue plants occur in these communities seems to indicate these sites have been incapable of supporting that species. A possible retrogressive pathway would be the reduction in abundance of Sandberg's bluegrass, perennial forbs, and bluebunch wheatgrass with resulting increase in coverage by Wyeth's buckwheat. Lack of annual bromes may result from the inability of the site to promote their invasion (i.e., cold temperatures, high soil saturation) or reflect the selective exclusion by the grazing animal. The occurrence of pine bluegrass and oniongrass reflects a more mesic regime resulting from higher precipitation available in this portion of the Wallowa-Snake Province as well as longer seasonal duration of moisture availability from rim seepages. Chemical analysis of the reddish soils common throughout the range of this type may result in a better understanding as to why Idaho fescue is not present in these communities.

Series Relationship - Bluebunch wheatgrass/Wyeth's buckwheat communities are often located near grand fir or Douglas-fir forested stands or at slope locations where moisture availability and/or cooler temperatures prevail (upper canyon slopes with higher seepage duration; lower canyon slopes near v-canyon riparian bottoms). Idaho fescue-bluebunch wheatgrass high elevation communities on steep slopes are often adjacent to AGSP/ERHE communities. Cusick's camas seepage communities often occur on adjacent sites where moisture is available longer with the vernal season.

The type is differentiated from other bluebunch wheatgrass dominated grasslands by lack of Sandberg's bluegrass and annual grasses and by the occurrence by pine bluegrass, oniongrass, and Blue Mountain penstemon, all of which are restricted to this type.

Role of Fire - Wyeth's buckwheat is very susceptible to fire (Volland and Dell-1981). It has demonstrated the ability to increase on burned sites following a significant initial decrease in communities on the upper Snake River Plains of Idaho (Wright, et al - 1979). Its rhizomes are apparently able to survive and proliferate the species following fire. Bluebunch wheatgrass is stimulated by fire except during the driest months of summer when low moisture content of the vegetation allows the heat to damage reproductive root crown buds and shoots.

Management Considerations - Management should be for bluebunch wheatgrass as the dominant and most successful forage species on the site. Reduction of impact on these communities in early summer may improve the status of bluebunch wheatgrass in relation to perennial forb composition. Oniongrass is generally low in occurrence. It is relished by all ungulates in spring and early summer. Less early season impact may increase its abundance.

Productivity - Overall forage production is among the lowest of all types sampled and the lowest in the bluebunch wheatgrass series for production of bluebunch wheatgrass. Mid and late seral communities can produce equivalent amounts and variety of forage species.

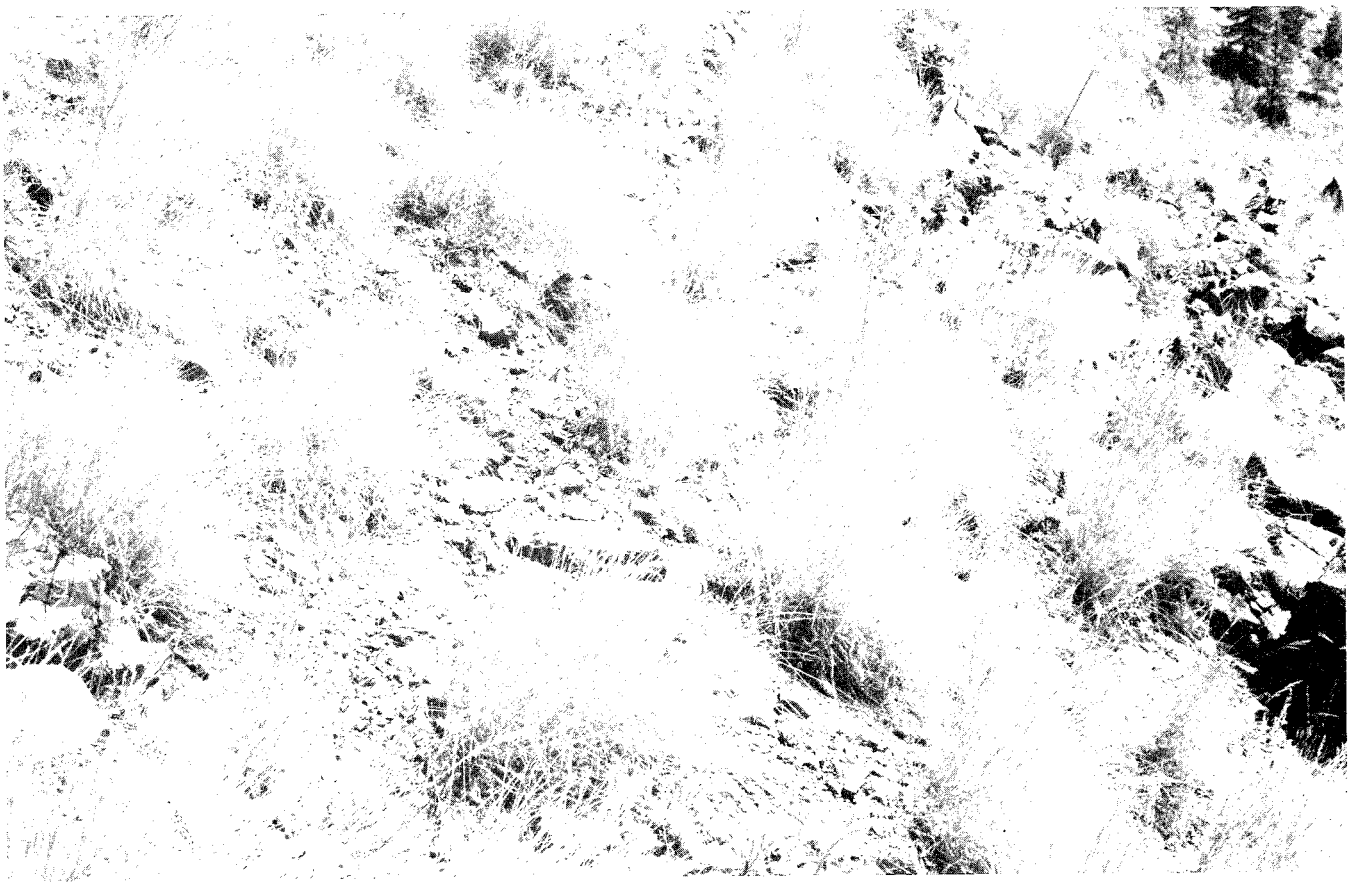
Comparison With Other Studies - The AGSP/ERHE plant association is probably endemic to the vicinity of North Pine Creek with its unique climatic and edaphic characteristics. A similar plant composition has been observed on basalts on the Nroth Fork of the Clearwater River in Idaho where winter and spring elk use is heavy (Moseley, personal communication). It has not been described elsewhere.

"One of the penalties of an ecological education
is that one lives alone in a world of wound."

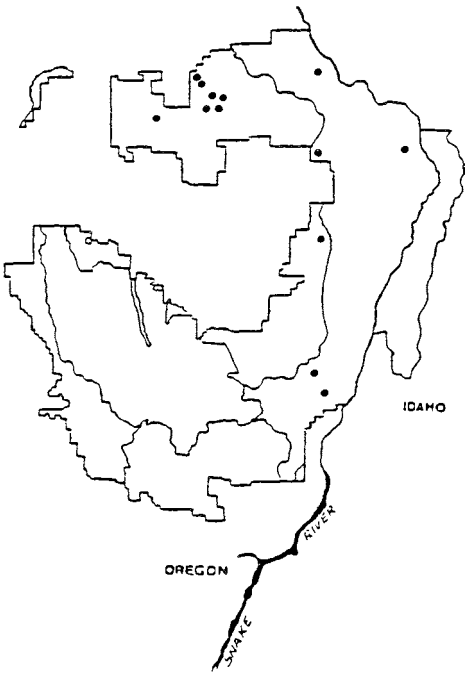
Aldo Leopold

Bluebunch wheatgrass - Sandburg's bluegrass/narrow-leaved skullcap plant association

Agropyron spicatum-Poa sandbergii/Scutellaria angustifolia
(AGSP-POSA3/SCAN) (GB41 12)



14. Mud Creek Canyon on Kuhn Ridge (Wallowa Valley Ranger District) *Plot 637*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA, WVRD	Parent Material: basalt colluvium
Elevation: (3600 ft.) 2850-4450 ft.	Solum depth: (18 in.) 7-31 in.
Aspect: (S-SSW) S to SW	Loess depth: (0)
Slope (56%) 35-74%	Root conc: (15 in.) 7-25 in.
Position: inter-rims at lower to upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/gravels
Other: unstable moving slopes	Surface soil/subsoil texture: loam/clay loam,clay

Table of Principal Species

AGSP-POSA3/SCAN (n = 13)

Species	Code	Mean Foliar Coverage (%)/Constancy (%) Late Seral (n=3)	Mid Seral (n=6)	Early Seral (n=4)	Late to Mid Seral Range
Grasses					
*bluebunch wheatgrass	AGSP	30/100	25/100	30/100	20-35
*Sandberg's bluegrass	POSA3	4/100	2/83	12/50	0-5
cheatgrass	BRTE	1/67	1/17	-	0-1
rattlesnake brome	BRBR	2/100	4/100	13/100	0-10
Japanese brome	BRJA	3/67		8/50	0-5
Perennial Forbs					
yarrow	ACMIL	2/100	2/100	7/100	1-5
hot rock penstemon	PEDE	-	3/83	1/100	0-5
*narrow-leaved skullcap	SCAN	2/100	8/100	11/100	1-20
arrowleaf balsamroot	BASA	1/33	2/67	-	0-5
common eriophyllum	ERLA	10/33	4/67	2/50	0-10
fern-leaved lomatium	LODIE	1/33	3/33	10/75	0-5
Annual Forbs					
prickly lettuce	LASE	1/33	1/83	1/75	0-1
sleepy cat	SIAN2	1/100	1/17	1/25	0-1
blepharipappus	BLSC	2/100	4/67	2/50	0-5
Douglas' knotweed	PODO	3/33	3/33	1/25	0-5
tall annual willowweed	EPPA	-	1/33	6/50	0-1
deerhorn	CLPU	5/67	5/67	8/50	0-10
thread-leaf phacelia	PHLI	-	1/50	-	0-1
rock		28/100	56/100	56/100	5-80
gravel		30/33	15/67	15/50	0-60
bareground		8/100	13/100	5/75	3-25
moss		15/67	2/100	6/50	0-25
litter		17/100	7/100	18/100	1-20
Herbage Production (lbs/acre dry wt.)					
bluebunch wheatgrass		300	290	255	110-520
other forage spp.		90	85	130	10-175
Total		390	375	385	120-590

* Principal Indicator Species

Vegetative Composition - Communities of the AGSP-POSA3/SCAN plant association occupy gravelly, shifting colluvium on steep slopes in the canyons. In late seral stage, bluebunch wheatgrass (AGSP) dominates with Sandberg's bluegrass (POSA3) present in low amounts. Sandberg's bluegrass is often found in refuge behind barriers to shifting surface rock and soil. Narrow-leaved skullcap (SCAN) is able to compete well on these shifting gravelly slopes by extending rhizomes deep into the colluvium for anchorage and to tap subsurface moisture. In many situations, skullcap tends to stabilize these slopes. Other perennial forbs commonly occurring in the type are yarrow (ACMIL), common eriophyllium (ERLA), and hotrock penstemon (PEDE). Fern-leaved lomatium (LODIE) and spreading dogbane (APAN) are two plants occasionally present on these hot, dry sites.

Communities degenerated from grazing show a slight decline in bluebunch wheatgrass, moss, and litter with a resultant increase in bare ground. Annuals that tend to become more frequent are prickly lettuce (LASE), sleepy cat (SIAN2) and deerhorn (CLPU). Skullcap tends to increase as the slopes ravel from animal trafficking. Arrowleaf balsamroot is a minor increaser. Rattlesnake brome tends to be the principal annual brome increasing in this type.

Distribution and Environmental Features - These communities are found throughout the canyonlands on basalt substrates. Although represented in the Snake, Imnaha, and Big Sheep Creek Canyons, they appear to be most prevalent in Joseph Creek Canyon and its tributaries.

Elevations range from 2,850 to 4,450 feet in elevation (mean: 3,600) and overlap with both the lower to mid-elevation bluebunch wheatgrass communities (i.e., granitic AGSP-POSA3, AGSP-POSA3/PHCO2, AGSP-POSA3/ASCU4, AGSP-POSA3/OPPO), and the higher elevation bluebunch wheatgrass communities (i.e., basaltic AGSP-POSA3, AGSP/ERHE). Sites are on the lower to upper third of moderately steep to steep (range 35-74%, mean: 56%) unstable inter-rim slopes. This type has been found only on Yakima basalt flows. Aspects range from south-southeast through south-southwest, but are predominantly southerly at elevations above 4,000 feet.

Soils - Soils are typically dark brown in color in surface layers, less than 30 inches in total depth, and formed in basalt colluvium. Surface layers have loam textures or occasionally are clay loams where erosion has removed the upper soil layer. Rock fragments are 15% to greater than 35% by volume. Subsoils are always more clayey and have clay loam and clay textures with greater than 35% rock fragments by volume. Rock fragments tend to be almost exclusively gravel-sized throughout the soil layers. Surface rock often exceeds 60% total cover.

The nearly constant movement of colluvium across slopes accounts for the variable soil depths associated with this type. Typically deeper soils occur in accumulation areas while shallower soils occur in eroded landforms. Other soil characteristics, however, are relatively uniform. Talus stringers and recently transported gravels are common on these sites and can substantially reduce the amount of acreage capable of supporting vegetation and, hence, forage production. Lack of stability is due primarily to the predominence of gravel-sized rock fragments. Unlike sites supporting AGSP-POSA3 basalt vegetation where cobble or stone-sized materials help to form relatively stable soils, the gravels common in AGSP-POSA3/SCAN are more easily displaced and transported over steeper slope surfaces. Total mean solum depth is below average in comparison to other sites supporting bluebunch wheatgrass.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3/SCAN

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
5 in. to 40 in.	5 in. to 40 in.	0	5 in. to 30 in.	un-stable	56°F to 70°F	0 to 19 in.	40% to 80%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationship - Skullcap and eriophyllum are two species capable of existing on unstable slopes and on sites that are among the hottest and driest during the summer drought period. The high number of annuals in the AGSP-POSA3 types indicates the inability of perennial vegetation to occupy the total site. Annuals are more adapted to taking advantage of spring moisture by germinating and setting seed in a short time period. In more mesic plant associations, where moisture is retained longer into the growing season, annuals must compete with other more vigorous plants for the limited space between established perennial bunchgrasses.

Series Relationship - AGSP-POSA3/SCAN often is found on southern aspects adjacent to FEID-KOCR communities. Hot rock penstemon and skullcap are perennials that are best represented in AGSP-POSA3/SCAN of all bluebunch wheatgrass-dominated types. Annuals attaining their highest constancy in this type are prickly lettuce (LASE), deerhorn (CLPU), and blepharipappus (BLSC). AGSP-POSA3 (basalt) often forms a mosaic with AGSP-POSA3/SCAN. Differences between these two high elevation AGSP-POSA3 types are as follows:

1. Lack of skullcap in AGSP-POSA3 (basalt) in late and mid-seral communities

2. Bluebunch wheatgrass and Sandberg's bluegrass abundance almost double on AGSP-POSA3 (basalt) communities

3. Lupines and narrow-leaved collomia common in AGSP/POSA3 (basalt) communities are infrequent in the AGSP-POSA3/SCAN type.

4. Unstable colluvial slopes occur in AGSP-POSA3/SCAN sites. Surface gravel coverage is highest for the bluebunch wheatgrass series (mean coverages = 47%).

Role of Fire - Fuels may limit the ability of fire to carry well in these communities. A light fire will promote increased flowering and seed-set of bluebunch wheatgrass plants. Intense fires in mid-summer to early fall may be detrimental to bluebunch wheatgrass bunches. Annual vegetation may temporarily increase in the interspaces. The rate of spread is increased as density of annual vegetation increases.

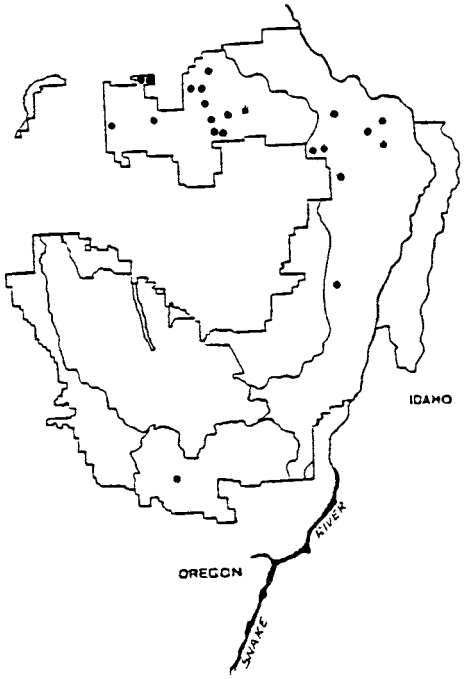
Management Considerations - Bluebunch wheatgrass is the primary forage species to manage. Instability on steep slopes may be increased by animal trafficking in communities belonging to this type. Use should be avoided in these communities prior to drying of saturated soils in the spring. Use on summer ranges should start following the flowering period of bluebunch wheatgrass (usually late June to mid July).

Productivity - Total herbage production and production of bluebunch wheatgrass is low in comparison to other bluebunch wheatgrass-dominated types. Both forbs and bluebunch wheatgrass produce forage amounts among the lowest of all bunchgrass types. A reduction in wheatgrass production and a corresponding increase in forbs occurs in early seral communities.

Comparison With Other Studies - The AGSP-POSA3/SCAN plant association has not been characterized previously.

Bluebunch wheatgrass - Sandberg's bluegrass plant association
Agropyron spicatum-Poa sandbergii
(AGSP-POSA3) (basalt) (GB41 13)

15. East Fork Fence Creek Canyon (Hells Canyon NRA) *Plot 430*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: basalt bedrock + colluvium, minor loess
Elevation: (4100 ft.) 3500-4900 ft.	Solum depth: (26 in.) 13-29 in.
Aspect: (SW) E to SW	Loess depth: (0)
Slope (55%) 30-70%	Root conc: (17 in.) 5-32 in.
Position: inter-rims at mid to upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/cobbles
Other: most typical AGSP/POSA3 type at elevations greater than 3800 ft.	Surface soil/subsoil texture: loam,silt loam/clay loam, silty clay loam,clay

Table of Principal Species

AGSP-POSA3 (basalt) (n = 27)

Mean Foliar Coverage(%)/Constancy(%)

Species	Code	Late Seral (n=4)	Mid Seral (n=13)	Early Seral (n=8)	Very Early Seral (n=2)	Late to Mid Seral Range
Grasses						
*bluebunch wheatgrass	AGSP	54/100	33/100	23/100	6/100	20-65
*Sandberg's bluegrass	POSA3	7/100	7/100	4/100	7/100	1-20
rattlesnake brome	BRBR	3/100	3/92	4/75	-	0-10
cheatgrass	BRTE	2/50	2/23	6/50	1/50	0-5
Perennial Forbs						
yarrow	ACMIL	3/100	7/100	3/100	10/50	1-25
arrowleaf balsamroot	BASA	3/100	4/77	6/75	30/50	0-15
*silky lupine	LUSE	1/75	2/62	1/25	10/50	0-3
swale desert parsley	LOAM	1/25	2/38	5/38	-	0-5
fern-leaved lomatium	LODIE	3/50	1/31	8/25	-	0-3
hot rock penstemon	PEDE	1/50	4/38	1/38	-	0-5
yellow salsify	TRDU	1/50	1/38	2/38	6/100	0-1
Annual Forbs						
prickly lettuce	LASE	1/50	1/62	2/38	1/50	0-1
*tall annual willowweed	EPPA	1/75	1/31	6/38	3/50	0-1
deerhorn	CLPU	4/75	3/38	7/63	-	0-10
blepharipappus	BLSC	2/75	4/46	2/50	-	0-15
*narrow leaved collomia	COLI2	2/100	2/31	1/25	-	0-3
rock		30/100	27/100	43/100	6/100	5-65
gravel/pavement		9/50	18/54	18/38	30/50	0-30
bare ground		7/100	23/100	16/100	10/100	1-40
moss		7/100	5/62	4/63	10/50	0-20
litter		7/100	18/92	10/100	30/50	0-40
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		480	670	310	-	370-770
other forage spp.		145	80	180	-	20-110
Total		625	750	490	-	410-890

* Principal Indicator Species

Vegetative Composition - This type represents one of the highest elevational extensions of the AGSP-POSA3 communities. It is considered the typic AGSP-POSA3 for the Wallowa-Snake Province. In late seral stage, the AGSP-POSA3 communities on basalt substrates contain the highest bluebunch wheatgrass (mean: 54%) and Sandberg's bluegrass (mean: 7%) cover among the AGSP/POSA3 types. Arrowleaf balsamroot (BASA), silky lupine (LUSE), yarrow (ACMIL), and a limited variety of annuals in low coverage constitute the rest of the composition (i.e., prickly lettuce (LASE), deerhorn (CLPU), tall annual willowweed (EPPA), blepharipappus (BLSC), and rattlesnake brome (BRBR)).

With degenerating condition, bluebunch wheatgrass and mosses decline. Early seral stages may show greater frequency of annual bromes (BRBR, BRTE), yarrow, arrowleaf balsamroot, tall annual willowweed, deerhorn, and blepharipappus. Rock and gravel surface cover increases with disturbance in AGSP/POSA3 communities because steep slopes (mean: 55%) are displaced easily due to trafficking by large ungulates. Fine soil particles may then be displaced due to scant protective vegetative cover.

At the higher elevations of the canyonlands, bluebunch wheatgrass begins to lose its strict bunch-habit and becomes more rhizomatous. This is even more pronounced in higher elevation FEID-AGSP and FEID-KOCR communities.

Sandberg's bluegrass is not able to persist well on steep slopes, and becomes less frequent as the slope length increases down from the ridgebrow. As colluvium becomes more stable between rims, Sandberg's bluegrass generally can maintain itself on the site. Sandberg's bluegrass remains constant at about 5-7% coverage through the various seral stages.

Distribution and Environmental Features - AGSP-POSA3 (basalt) communities are found across the northern ridges of Wallowa Valley Ranger District through the lower Imnaha and into the Snake River Canyon north of Copper Creek. Elevations range from 3,500 to 4,900 feet (mean: 4,100), the second highest mean elevation of all communities in the bluebunch wheatgrass series. The type occurs exclusively on Yakima basalt flows. Sites are mostly in the upper third of moderately steep to steep (range 30-70, mean: 55%) inter-rim slopes or inclusions within more extensive backslopes. Although these slopes appear more stable than those supporting AGSP-POSA3/SCAN, movement of colluvial material over time has created sites with variable soil depth and surface microrelief.

Soils - Soils are typically dark brown in color in surface layers, less than 29 inches in total depth, and formed in basalt colluvium with minor loess influence. Surface layers have loam or occasionally silt loam textures and greater than 35% rock fragments by volume. Subsoils also have greater than 35% coarse fragments, but contain clay loam and clay textures. Coarse fragments are cobble and gravel-sized in surface layers and cobble and stone-sized in subsoil layers. Surface rock usually exceeds 40% cover.

Soils vary mainly in regard to depth and degree of loess influence. In more stable colluvial deposits perched above rims, deeper soils may develop. Shallower soils tend to develop nearer rim exposures or where colluvial accumulation has been less. Both wind-deposited and gravity-transported loess has to some degree influenced these sites. Subsequent erosion probably carried away most of this material, especially on windward slopes. Where rock or slope position favored accumulation of downward moving materials, loess may have been trapped and incorporated with other soil material. Such areas exist where basalt

rims act as barriers creating a perched toeslope at mid to upper slope levels. The predominance of cobble to stone-sized rock fragments, common in this type, may also have aided in site stability. Deeper soils tend to be more loess influenced. Sites supporting AGSP-POSA3 communities are above average in total solum depth and contain only moderate amounts of bedrock exposures.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3 basalts

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
10 in. to 32 in.	4 in. to 32 in.	0	4 in. to 13 in.	unstable to mod. stable	58°F to 64°F	0 to 4 in.	15% to 60%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - Hot, catastrophic range fires and severe overgrazing by cattle will often promote dense homogeneous stands of cheatgrass in this type. If the bunchgrass seed source is not lost, fire is prevented and grazing pressure is reduced, these sites may succeed to AGSP-POSA3 domination again, but only after a very long period of time (estimate: 50 to 100 years). Most retrogressive occurrences are less dramatic (i.e., rodent circles) and require a significantly reduced time frame for healing (estimate 10-30 years).

Synecological Relationship - The southerly aspect and shallow soils characteristic of the AGSP/POSA3 type create moisture conditions that are too limiting to Idaho fescue. Summer temperatures are too high and dry the soil to levels below the reach of fescue roots. The shallow-rooted Sandberg's bluegrass on the other hand, is able to survive by completing growth, flowering, and seed-set prior to the summer drought period when it simply aestivates until fall rains rejuvenate the plant. AGSP-POSA3, PSME/PHMA, FEID-AGSP, or FEID-KOCR communities may occur on northerly aspects adjacent to the type.

Series Relationship - Comparison with the other AGSP-POSA3 types provides the following for mid and late seral stages of basaltic AGSP-POSA3 communities:

1. highest in elevation (4,000 feet vs. less than 2,500 feet mean elevation for other AGSP-POSA3 types). AGSP/ERHE is highest bluebunch wheatgrass series type (mean: 4,800 feet).
2. highest bare ground (mean: 19%)
3. AGSP and POSA3 cover highest (mean: AGSP-38%; POSA3-7%). Sandberg's bluegrass coverage in this type averages almost twice as much as that found in the next closest type in the series; AGSP-POSA3/PHCO2 (mean: 4%).
4. common occurrence on upper third of slopes.

Role of Fire - Light fires should promote seed-set and enhance the competitive ability of bluebunch wheatgrass in these communities. The density of the bluebunch wheatgrass foliage will influence the spread of fire and ability of flames to carry through a stand. Annual vegetation may temporarily increase in the interspaces between bunches and other perennial plants.

Cheatgrass will from continuous pure stands following early season fires. Perennial grasses are weakened by fire periodicity that limits the ability of the grass to manufacture and store nutrients for subsequent annual rejuvenation.

Fire cannot be used to convert annual brome stands back to native bunchgrass vegetation. Elimination of disturbance does not improve the perennial:annual ratio either. The only reclamation of these lands is by use of chemical herbicides, plowing under of the brome patch, and re-seeding using wheatgrass (Wright 1982).

Management Considerations - Cattle prefer bluebunch wheatgrass in these communities. They may also reduce the amount of Sandberg's bluegrass in the type through overgrazing and trampling. Extensive photographic trend sampling tends to support the loss of Sandberg's bluegrass on rangelands where deer, elk, and cattle graze. Early season usage on these steep, vegetation-poor slopes may be detrimental. The steepness of slope and colluvial movement resulting from trafficking of large animals may have the major impact to Sandberg's bluegrass survival. Wild ungulates using south slope AGSP-POSA3 in the spring months may also decrease the Sandberg's bluegrass composition by trafficking on steep slopes when the soils are saturated. Sheep tend to utilize cheatgrass, the primary increaser in these communities. On sheep range, Sandberg's bluegrass may tend to increase as a result of sheep usage (Daubenmire 1970) where preference is to competing succulent annual vegetation.

Bluebunch wheatgrass is the species to manage since it supplies a majority of the total forage produced and is the most preferred species for ungulates. Utilization by winter grazing livestock should cease prior to onset of the boot stage (usually in May to early June). Use on summer ranges should be initiated following the flowering period of bluebunch wheatgrass and definately not during the boot stage.

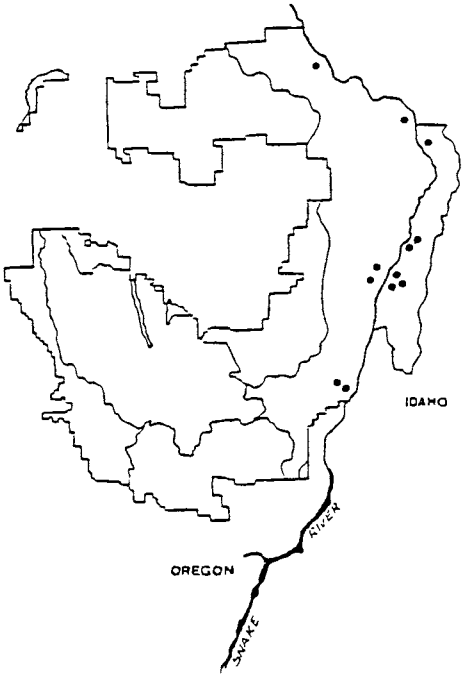
Annual bromes provide early spring grazing forage, especially in early seral communities where cheatgrass dominates and desirable perennials are fewer. However, it becomes less preferred as it reaches curing stage (usually in late June to mid July) due to its unpalatable seedheads and hairy foliage.

Productivity - Overall production is moderately high in communities in the AGSP-POSA3 (basalt) type. Production of bluebunch wheatgrass ranks third among all bluebunch wheatgrass plant associations. A significant decrease in production for all forage species may occur in early seral communities.

Comparison with Other Studies - Daubenmire (1970) first defined AGSP-POSA3 occurring as a zonal habitat type on steep canyon sideslopes and as an edaphic type on gentle scablands. His steep canyon sideslope AGSP-POSA3 is similar compositionally to the type characterized in this study, but he describes the type on slopes ranging from 11% to 51% (mean: 25%) with the highest elevation occurring at only 1,571 feet. His substrate varies and gray rabbitbrush is often a component. AGSP-POSA3 communities on the Hells Canyon NRA and Wallowa Valley Ranger District have been observed at high elevations, on basalt exclusively, with steeper slopes, and containing no shrub component. Hall (1973) included AGSP-POSA3 in his "FEID-AGSP, shallow, steep" and "FEID-AGSP, deep, steep" plant community types. Tisdale (1979, 1986) includes similar vegetation in his AGSP/POSA3 habitat type which encompasses lower elevation sites. Mueggler and Stewart (1980) classified an AGSP/POSA3 habitat type that was richer in perennial forbs and contained prairie junegrass. Prairie junegrass is restricted in this study to those types capable of producing Idaho fescue. Idaho fescue is absent in the AGSP-POSA3 plant associations of the Wallowa-Snake Province.

Bluebunch wheatgrass - Sandberg's bluegrass/Cusick's milkvetch plant association
Agropyron spicatum - Poa sandbergii/Astragalus cusickii
(AGSP-POSA3/ASCU4) (GB41 14)

16. Cache Creek (Hells Canyon NRA) *Plot 959*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: meta-volcanic colluvium + loess
Elevation: (3000 ft.) 2500-3700 ft.	Solum depth: (52 in.) 40-60 in.
Aspect: (SSE) E to W	Loess depth: (0)
Slope (56%) 35-80%	Root conc: (17 in.) 13-20 in.
Position: mid 1/3 to upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/gravels
Other: most common bluebunch wheatgrass type on metavolcanics	Surface soil/subsoil texture: loam/loam, clay loam

Table of Principal Species

AGSP-POSA3/ASCU4 (n = 12)

Mean Foliar Coverage (%)/Constancy (%)

Species	Code	Late Seral (n=3)	Mid Seral (n=3)	Early Seral (n=4)	Very Early Seral (n=2)	Late to Mid Seral Range
Grasses						
*bluebunch wheatgrass	AGSP	30/100	27/100	26/100	6/100	25-30
Sandberg's bluegrass	POSA3	1/67	4/100	3/75	2/100	0-10
cheatgrass	BRTE	2/67	8/67	6/100	12/100	0-10
rattlesnake brome	BRBR	1/67	5/33	-	2/50	0-5
Japanese brome	BRJA	3/67	-	1/25	5/50	0-5
foxtail fescue	FEME	1/33	5/33	15/50	20/50	0-5
Perennial Forbs						
yarrow	ACMIL	2/100	5/100	3/100	1/50	1-10
*Cusick's milkvetch	ASCU4	4/67	4/100	5/100	3/100	0-5
narrowleaved skullcap	SCAN	3/67	5/33	5/75	-	0-5
*arrowleaf balsamroot	BASA	10/67	10/100	13/100	23/100	0-15
shaggy fleabane	ERPU	1/67	1/33	1/75	1/50	0-1
prickly pear	OPPO	1/33	3/33	2/50	-	0-3
thistle	CIRSIUM	1/33	2/67	2/75	-	0-3
Snake River phlox	PHCO2	1/67	1/33	1/75	-	0-1
yellow salsify	TRDU	1/33	-	1/50	1/50	0-1
prickly lettuce	LASE	-	1/67	1/50	2/100	0-1
Annual Forbs						
common cryptantha	CRIN2	1/33	3/67	1/100	5/50	0-5
thyme leaf sandwort	ARSE	5/33	1/33	1/75	3/50	0-5
sleepy cat	SIAN2	-	-	1/67	1/50	-
blue forget-me-not	MYMI	-	1/33	1/50	1/50	0-1
blepharipappus	BLSC	1/33	1/33	1/25	-	0-1
cleavers	GAAP	-	1/100	1/25	1/50	0-1
Venus' looking-glass	TRPE2	-	1/67	1/25	1/50	0-1
rock		25/100	10/100	10/100	1/100	5-50
gravel/pavement		17/100	23/100	18/100	6/100	0-30
bare ground		3/100	5/100	13/100	3/100	1-10
moss		7/67	3/67	4/75	40/50	0-10
litter		19/100	15/100	15/100	25/100	3-30
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		325	290	180	-	140-425
other forage species		160	90	280	-	30-275
total		485	380	460	-	410-550

* Principal Indicator Species

Vegetative Composition - This plant association represents AGSP-POSA3 communities occurring on metavolcanic rock at lower to mid-elevations in the canyons where a mesic assemblage of forbs is associated. The AGSP-POSA3 community on these substrates contains a more varied plant composition than AGSP-POSA3 on basalts. Bluebunch wheatgrass (AGSP) and Sandberg's bluegrass (POSA3) are the principal perennial grasses with Cusick's milkvetch (ASCU4) and arrowleaf balsamroot (BASA) commonly associated. Other perennials regularly occurring are yarrow (ACMIL), skullcap (SCAN), shaggy fleabane (ERPU), and thistle (CIRSI).

With degradation, bluebunch wheatgrass declines in cover. Sandberg's bluegrass tends to increase. Cheatgrass, the primary increaser, becomes more abundant with disturbance. Perennials which increase as a result of disturbance in this type are arrowleaf balsamroot, yarrow, and prickly pear (OPPO). Balsamroot should also be used as one of the key indicators of disturbance in this type with cheatgrass providing a reflection of severe abuse when it occurs in dense patches. Other increasing annuals notable in the early seral stage are: thyme leaf sandwort (ARSE), common cryptantha (CRIN2), and sleepy cat (SIAN2).

Cusick's milkvetch appears to have an affinity for metavolcanic substrates in the Snake River Canyon. Although the milkvetches are considered increasers with disturbance throughout many rangelands of the west, Cusick's milkvetch did not tend to increase dramatically with overgrazing in this plant association. The plant appears to thrive on gravelly slopes.

Very early seral stages would be exemplified by a perennial forbland containing a high abundance of arrowleaf balsamroot. Balsamroot colonizes available growing space left by overgrazing of more desirable bunchgrass vegetation. However, annuals would continue to be a major component of these sites with annual bromes, yellow salsify (TRDU), blue forget-me-not (MYMI), prickly lettuce (LASE), and sleepy cat (SIAN2) often providing weedy patches.

Distribution and Environmental Features - Communities of the AGSP/POSA3/ASCU4 plant association occur in the deeply dissected Snake River Canyon from Temperance Creek upriver and in the section between Copper Creek and Pittsburg Landing. They are restricted to these lower and mid elevation slopes of metavolcanic origin. Elevations range from 2,500 feet to 3,700 feet (mean: 3,000), covering essentially the modal elevational zone for communities in the bluebunch wheatgrass series. Typical sites are on depositional landscapes with moderately steep to steep slopes ranging from 35 to 80% (mean: 56%). Communities occur on the lower third to upper third of slopes and have mostly convex to occasionally complex surfaces. Aspects are usually southeast, but range from east through west.

Soils - Soils are typically very dark grayish brown in surface layers, greater than 40 inches in total depth, and formed in deep colluvium from metavolcanic rock. Surface layers have loam textures with commonly greater than 60% rock fragments by volume. Subsoils are often nearly identical, although clay concentrations may be present as indicated by thin soil layers with clay loam or clay textures. Rock fragments tend to be gravel-sized throughout the soil layers with abundance dictated by the nature of fracturing and weathering of the metamorphozed volcanic rock. Cobbles and stones are seldom present. Surface rock and gravels generally exceed 30% cover.

As with other soils that are derived from colluvium, variation in soil depth is common. The typical rim-rocks associated with basalt topography are much less extensive in metavolcanic landforms. As a result, these landscapes are often made up of massive irregular-shaped rock and extensive uninterrupted slopes without bedrock barriers to downhill movement of soil and rock material. These slopes are often comprised of deep colluvium and support AGSP-POSA3/ASCU4 communities. These are the deepest soils found to support members of the bluebunch wheatgrass series. These slopes are quite active since clay accumulations, typical in more stable soils, are uncommon on these sites. Above the occasional rock barriers, colluvial material may accumulate to great depths, but nearest the rock outcrop shallower soils occur which support AGSP-POSA3/ASCU4 communities. These shallower soils are typically less than 20 inches in depth, have silt loam surface soil textures, and silty clay loam subsoil textures. They are dark brown in color and have less than 60% rock fragments by volume.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3/ASCU4

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
17 in. to 60 in.	8 in. to 20 in.	0	3 in. to 11 in.	unstable to mod. stable	53°F to 60°F	0 to 8 in.	20% to 50%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationship - Paired sample plots were established on contrasting slopes to study species affinities and differences within early seral AGSP-POSA3/ASCU4 communities in lower Sheep Creek Canyon of the Hells Canyon NRA in Idaho. The dominant bluebunch wheatgrass was equal on both sites in coverage. Soils were slightly deeper and surface rock, gravel, bare ground exposure greater (60% vs. 25%) on the southeast exposure. Cheatgrass tended to be more abundant on southeasterly slopes on deeper soil locations than on southwesterly slopes and thinner soil locations. Foxtail fescue (FEME) was common on animal trails and was restricted to the droughtier southwesterly exposure. Skullcap occupied gravelly, active colluvial strip on the droughtier exposures at a ratio of 3:1 over the deeper soils with more favorable southeasterly exposure. Balsamroot coverage doubled on the droughtier site. Death camas (ZIVEG) preferred the easterly aspect and was absent from the hotter, drier southwest facing site.

Series Relationship - Idaho fescue is not associated with these droughty sites. FEID-KOCR (low) is frequently a north-aspect contrasting type at these lower elevations. GLNE/AGSP, AGSP-POSA3/OPPO, and AGSP-POSA3/ERPU are very common on metabasaltic rims and rocky outcrops adjacent to this type.

Comparison of the AGSP/POSA3 types provides the following for mid and late seral stages of AGSP-POSA3/ASCU4:

1. highest ASCU4 (mean: 4%) and BASA (mean: 10%). Balsamroot coverage averaged 12% in AGSP/ERHE where POSA3 is usually absent.
2. lowest moss coverage (mean: 5%)
3. highest forb coverage
4. confined to metavolcanic substrates
5. coarse fragments in soils were more gravel-sized.

Role of Fire - Bluebunch wheatgrass is enhanced by light fire during the moister months of early spring or late fall. Arrowleaf balsamroot is very resistant to fire with rapid regrowth from its stout caudex (Volland and Dell; 1981). AGSP-POSA3 sites damaged by intense burns will favor perennial forbs and annual vegetation.

Management Considerations - Cattle preference is to bluebunch wheatgrass. These communities should be managed to promote this key species. Sheep tend to prefer perennial forbs and succulent annuals and may improve the bunchgrass composition on these sites with proper herding. Sandberg's bluegrass is present only in low amounts due to colluvial activity of the steep slopes. Animal movement on the slopes may increase the amount of active colluvial activity.

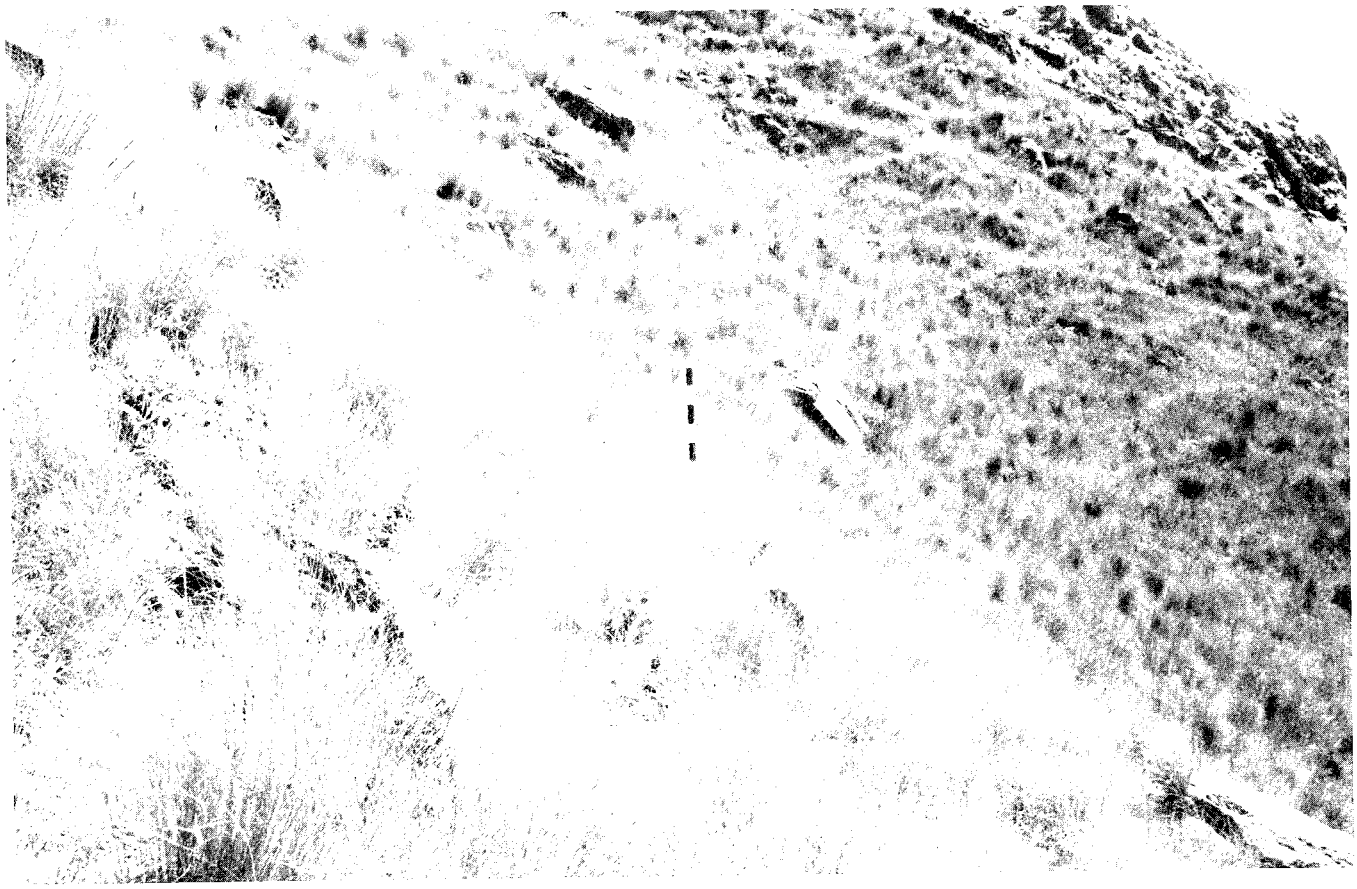
Arrowleaf balsamroot is usually present and becomes more common in earlier seral stages as a result of decreased competition with bunchgrasses. The species is used to indicate range readiness when the majority of plants are in flower (Range Plant Handbook - 1937). The plant provides desirable diversity to the perennial community in late seral stage. As the balsamroot begins to occupy the site more fully, total site production often increases, but forage preference is lowered and nutritional gains decline as the grassland converts to forbland. Deer and elk show a preference for balsamroot flowers and horses relish them.

Some milkvetches are toxic to livestock. All classes, but especially horses, tend to develop a craving for the plant on early seral rangelands. The key to avoidance of poisoning problems is to maintain the rangelands containing milk-vetches in mid and late seral stages so that more preferred plants are avail-able. The toxicity of Cusick's milkvetch is uncertain. The most cost-efficient method of controlling milkvetches is to reduce grazing pressure, especially during sensitive phenologic periods for bluebunch wheatgrass.

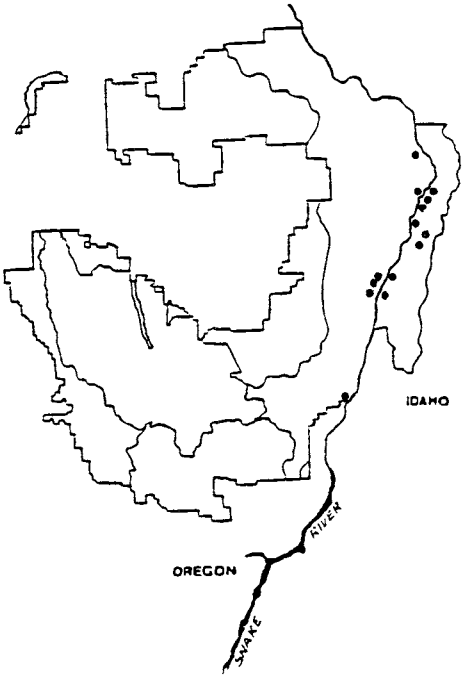
Productivity - Total herbage production and bluebunch wheatgrass production is low to moderate in comparison to other bunchgrass communities. Standing biomass of bluebunch wheatgrass decreases in all lower seral communities, and in early seral stages, may decline significantly. As weediness of communities increases, so does production by other forage species, especially arrowleaf balsamroot. As a result, communities in the early seral stages may have nearly equal amounts of forage as those in the late seral stage although the proportion of bluebunch wheatgrass to other forage species is different.

Comparison with Other Studies - The AGSP-POSA3/ASCU4 community confined to metavolcanic substrates has not been previously characterized.

Bluebunch wheatgrass - Sandberg's bluegrass/shaggy fleabane plant association
Agropyron spicatum-Poa sandbergii/Erigeron pumilus
(AGSP-POSA3/ERPU) (GB41 15)



17. Snake River Canyon South of Johnson Bar (Hells Canyon NRA) *Plot 932*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: colluvium, metavolcanic and other geology
Elevation: (2000 ft.) 1500-2600 ft.	Solum depth: (36 in.) 30-43 in.
Aspect: (SE-W) SE to WNW	Loess depth: (0)
Slope (57%) 30-65%	Root conc: (22 in.) 10-35 in.
Position: lower to mid 1/3 slopes	Depth to GT 35% rock frag./size: (12 in.) 3-22 in./gravels
Other: lowest elevation bluebunch wheatgrass type on metavolcanics	Surface soil/subsoil texture: loam, sandy loam/clay loam,sandy clay loam

Table of Principal Species

AGSP-POSA3/ERPU (n = 14)

Species	Code	Mean Foliar Coverage (%)/Constancy (%) Late Seral (n=4)	Mid Seral (n=4)	Early Seral (n=6)	Late to Mid Seral Range
Grasses					
*bluebunch wheatgrass	AGSP	26/100	24/100	18/100	20-30
*Sandberg's bluegrass	POSA3	2/95	-	1/17	0-5
cheatgrass	BRTE	5/50	4/100	16/100	0-5
rattlesnake brome	BRBR	1/25	1/25	2/50	0-1
foxtail fescue	FEME	3/50	1/25	11/67	0-5
Japanese brome	BRJA	5/25	6/75	10/33	0-15
Perennial Forbs					
yarrow	ACMIL	4/100	4/100	3/100	1-5
*Cusick's milkvetch	ASCU4	1/25	3/25	6/33	0-3
narrowleaved skullcap	SCAN	2/50	1/25	1/83	0-3
*arrowleaf balsamroot	BASA	1/25	-	1/33	0-1
*shaggy fleabane	ERPU	3/75	7/100	3/100	0-10
prickly pear	OPPO	3/50	3/50	5/83	0-5
*thistle	CIRSIUM	2/75	1/75	1/100	0-5
*varileaf phacelia	PHHE	1/75	1/75	1/17	0-1
large-fruited lomatium	LOMA	1/50	3/25	1/33	0-3
Snake River phlox	PHCO2	2/50	1/25	1/17	0-3
Annual Forbs					
common cryptantha	CRIN2	3/25	10/25	-	0-10
thyme leaf sandwort	ARSE	1/50	1/25	2/67	0-1
field filago	FIAR	1/25	3/50	1/17	0-5
sleepy cat	SIAN2	1/25	1/25	1/17	0-1
blepharipappus	BLSC	-	1/25	1/33	0-1
Indian wheat	PLPA	1/50	2/50	1/17	0-3
rock		15/100	9/75	5/100	0-25
gravel		30/100	27/75	13/100	0-45
bare ground		2/75	2/75	4/67	0-3
moss		23/75	20/75	22/100	0-45
litter		23/100	31/100	18/100	5-50
Herbage Production (lbs/acre dry wt.)					
bluebunch wheatgrass		530	600	130	480-600
other forage species		70	200	225	25-215
total		600	800	335	500-800

* Principal Indicator Species

Vegetative Composition - This plant association represents lower to mid-elevations in the canyons where a xeric assemblage of forbs is associated with AGSP-POSA3 communities occurring on metavolcanic rock. The AGSP-POSA3 type on these substrates contains a more varied plant composition than AGSP-POSA3 on basalts. Bluebunch wheatgrass (AGSP) and Sandberg's bluegrass (POSA3) are the principal perennial grasses with shaggy fleabane (ERPU) and thistles (CIUT, CIUN) common associates. Other perennials regularly occurring are prickly pear (OPPO) and varileaf phacelia (PHHE).

With degradation, bluebunch wheatgrass declines in cover. Sandberg's bluegrass is often very limited in its occurrence. Lower seral communities may contain no Sandberg's bluegrass, a species that is very sensitive to site stability. The primary increaser, cheatgrass, becomes more abundant with disturbance. Foxtail fescue (FEME) is very prolific in early seral communities. Other increasing annuals notable in the early seral stage are: thyme leaf sandwort (ARSE), field filago (FIAR), and Indian wheat (PLPA). Perennials which increase as a result of disturbance in this type are narrow-leaved skullcap (SCAN), shaggy fleabane (ERPU), and prickly pear (OPPO).

Distribution and Environmental Features - Communities in the AGSP/POSA3/ERPU type occur in the deeply dissected Snake River Canyon from Temperance Creek upriver to McGraw Creek. The type is restricted to these lower elevation metabasaltic slopes. Elevations range from 1,500 feet to 2,600 feet (mean: 2,000), covering the lower elevational zone for communities in the bluebunch wheatgrass series. The type commonly occupies depositional landscapes. Slopes are mostly steep, ranging from 30 to 65% (mean: 57%), and southeast to west-facing. Communities are located from lower third to mid third of slopes on convex to undulating surfaces.

Soils - Soils are typically brown to dark brown in color in surface layers, greater than 25 inches in depth, and formed in colluvium from metavolcanic or mixed geologies. Surface layers have loam textures with 15% to greater than 35% rock fragments by volume. Subsoils commonly have clayey layers with clay loam or sandy clay loam textures and greater than 35% rock fragments by volume. Rock fragments are predominantly gravel-sized throughout the layers, although stones and even boulders may be present. Surface rock and gravels usually exceed 30% cover.

Variability in soil depth is typical in these soils derived from colluvium. As with other sites on metavolcanic substrates, shallower soils near rock outcrops may support communities more typical of depositional areas especially if their water holding capacity is enhanced by the presence of clayey layers. In general, soil depth varies according to slope position. Lower slopes and footslopes often have soils exceeding 40 inches in depth. Midslopes nearer rock outcrops have shallower soil depths. Sites supporting AGSP-POSA3/ERPU have some of the deepest mean solum depths within the bluebunch wheatgrass series.

Synecological Relationship - Paired sample plots were established on contrasting southerly and northwesterly slopes in lower Sheep Creek of Hells Canyon NRA in Idaho to study species affinities and differences within the early seral AGSP-POSA3 communities. The dominant bluebunch wheatgrass was equal in coverage on both sites. Soil depths were equivalent at 7 inches. Surface rock, gravel and bare ground exposure was more significant on the south aspect site (36% vs 7%). Cheatgrass and prickly pear occupied the rockier south slopes much more abundantly than on northwesterly slopes. Foxtail fescue was commonly present on

animal trails of the northwest-facing slopes but was replaced by cheatgrass on the opposing slopes. Moister site species increased on the northwest aspect along with moss and litter.

Series Relationship - Idaho fescue is not associated with these droughty sites. FEID-KOCR (low) is frequently a north-aspect contrasting type at these lower elevations. GLNE/AGSP, AGSP-POSA3/OPPO, and AGSP-POSA3/ASCU4 are very common on metabasaltic rims and rocky outcrops adjacent to this type.

Comparison of the AGSP/POSA3 types provides the following for mid and late seral stages of AGSP-POSA3/ERPU:

1. highest average cover by shaggy fleabane (mean: 5%); (AGSP/POSA3/PHCO2 each average 2%)
2. highest gravel (mean: 29%) and litter (mean: 27%) surface cover; lowest surface rock (13%) and bare ground (2%) coverage.
3. most frequent occurrence and coverage by Japanese brome
4. confined to metavolcanic or mixed substrates
5. coarse fragments in soils more gravel-sized.

Role of Fire - Bluebunch wheatgrass is enhanced by light fire during the moister months of early spring or late fall. AGSP-POSA3 sites damaged by intense burns will favor perennial forbs and annual vegetation. Annual bromes are the principal increasing species with site disturbance in this type.

Management Considerations - Cattle preference is to bluebunch wheatgrass. These communities should be managed to promote this key species. Sheep tend to prefer perennial forbs and succulent annuals and may improve the bunchgrass composition on these sites with proper herding. Sandberg's bluegrass is present only in low amounts due to colluvial activity of the steep slopes. Animal movement on the slopes may increase the amount of active colluvial activity.

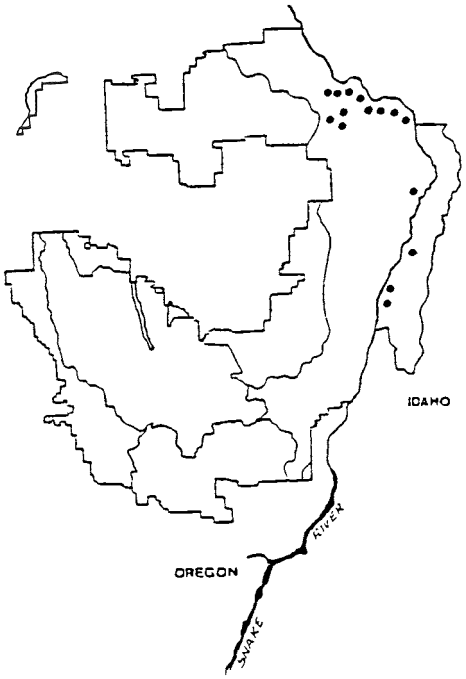
Annual bromes are promoted by soil displacement in this type. Although they provide early forage, the promotion of these annuals will create a season-long loss of available forage to the domestic animal due to early summer-curing and resultant unpalatability of these bromes. Use of these ranges should be at a level to maintain and promote vigorous and abundant bluebunch wheatgrass stands.

Productivity - Total herbage production and bluebunch wheatgrass production is low to moderately high in comparison to other bluebunch wheatgrass communities sampled. Production of bluebunch wheatgrass declines significantly in early seral stages. Production by other forage species, is higher in mid and early seral communities. As a result, mid seral stages may produce more forage than late seral ones. Because of the sharp decrease in bluebunch wheatgrass production, early seral communities produce only half the total forage of later seral stages.

Comparison with Other Studies - The AGSP-POSA3/ERPU community confined to metavolcanic substrates has not been previously characterized.

Bluebunch wheatgrass - Sandberg's bluegrass plant association
Agropyron spicatum-Poa sandbergii
(AGSP-POSA3) (granite) (GB41 16)

18. Trail Gulch, Snake River Canyon (Hells Canyon NRA) Plot 569



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: granodiorite bedrock
Elevation: (2000 ft.) 1300-3000 ft.	Solum depth: (14 in.) 8-20 in.
Aspect: (SW) E to W	Loess depth: (0)
Slope (45%) 7-68%	Root conc: (9 in.) 7-15 in.
Position: benches, saddles, upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/gravels,cobbles
Other: extends higher in elev. in Idaho	Surface soil/subsoil texture: loam,sandy loam/clay loam loam,sandy clay loam

Table of Principal Species

AGSP-POSA3 (granite) (n = 15)

Species	Code	Mean Foliar Coverage (%)/Constancy (%) Late Seral (n=3)	Mid Seral (n=7)	Early Seral (n=3)	Very Early Seral (n=2)	Late to Mid Seral Range
Grasses						
*bluebunch wheatgrass	AGSP	32/100	29/100	17/100	5/100	25-40
*Sandberg's bluegrass	POSA3	3/100	2/86	6/67	1/50	0-5
sand dropseed	SPCR	1/33	-	3/67	10/50	0-1
red three awn	ARLO3	10/33	2/43	10/33	28/100	0-10
foxtail fescue	FEME	3/33	8/29	1/67	1/50	0-15
*cheatgrass	BRTE	1/67	6/100	5/100	4/100	0-20
Japanese brome	BRJA	-	4/43	1/67	2/100	0-5
Perennial Forbs						
yarrow	ACMIL	5/67	6/86	2/100	3/50	0-15
hairy milkvetch	ASIN2	3/100	1/43	3/33	1/50	0-5
*large fruited biscuitroot	LOMA	3/33	1/57	3/67	7/100	0-3
arrowleaf balsamroot	BASA	3/67	5/57	8/67	2/100	0-10
*shaggy fleabane	ERPU	1/33	2/71	2/100	2/100	0-5
*prickly pear	OPPO	1/33	2/43	5/100	4/100	0-3
varileaf phacelia	PHHE	2/67	1/14	-	1/50	0-3
strict buckwheat	ERSTP	1/67	3/14	1/33	-	0-3
hairy golden aster	CHVI2	-	3/71	-	-	0-10
Snake River phlox	PHCO2	-	1/43	1/67	-	0-1
Annual Forbs						
thyme leaf sandwort	ARSE	4/67	5/29	3/33	1/50	0-5
Indian wheat	PLPA	1/33	4/43	7/100	4/100	0-5
common speedwell VEAR		1/33	2/43	2/67	-	0-5
rock		8/100	40/100	22/100	33/100	5-70
gravel		13/67	3/14	20/33	-	0-15
bare ground		7/100	6/100	6/67	4/100	1-10
moss		12/100	36/100	48/100	58/100	1-55
litter		43/100	16/100	9/100	5/100	5-55
Herbage Production (lbs/acre dry wt.)						
bluebunch wheatgrass		450	370	290	135	150-700
other forage species		85	190	300	400	50-350
total		535	560	590	535	340-800

* Principal Indicator Species

Vegetative Composition - This plant association represents lower elevations in the canyons where AGSP-POSA3 communities occur on pretertiary rock, mostly quartz diorite. The occurrence of Sandberg's bluegrass appears to be related to site stability. This species occurs more commonly on stable land surface microsites where natural barriers provide protection against soil movement. Cheatgrass is very common and other annual bromes (BRJA, BRBR) usually have significant cover in late seral communities. Perennial forbs are relatively uncommon in the type. Shaggy fleabane (ERPU), large fruited biscuitroot (LOMA), hairy milkvetch (ASIN2), and prickly pear (OPPO) are good indicators of the type. Annual forbs are common since these dry sites contain a high amount of open space between perennial plants. The more frequently occurring species are: common speedwell (VEAR), field filago (FIAR), thyme leaf sandwort (ARSE), and Indian wheat (PLPA).

As these dry sites are degraded, bluebunch wheatgrass declines in cover with resulting decline in litter cover. Increasing in frequency are annuals (especially Indian wheat, speedwell, and cheatgrass). Principal perennial forb increasers are arrowleaf balsamroot and prickly pear. On heavily overgrazed sites, prickly pear colonies often protect the few robust bluebunch wheatgrass relicts from further over-utilization. Red three awn (ARLO3) and sand dropseed (SPCR) invade the granitic AGSP-POSA3 when slopes are less than 35%.

Distribution and Environmental Features - The AGSP-POSA3 type on granitic (quartz diorite) substrates is most commonly found in the Imnaha River gorge below Cow Creek and from the mouth of the Imnaha River upriver to Deep Creek on the Snake. Other principal areas of occurrence are from Klopton to Kirkwood Creeks and in the lower-middle Sheep Creek vicinity in Idaho. In these canyons, the exposure of pretertiary rock is only at lower elevations. Elevations range from 1,300 to 3,000 feet (mean: 2,000), one of the lowest mean elevations for communities in the bluebunch wheatgrass series. Sites are most commonly steep (greater than 35%) inter-rim sideslopes, although this community also occurs on rocky saddles and moderately steep ridge brows of bench and terrace lands. Within these major landforms, the lower third to upper third of southeast and southwest facing slopes are common AGSP- POSA3 (granite) sites. Microrelief varies from smooth to convex and less commonly is slightly undulating.

Soils - Soils are typically very dark greyish brown in color in surface layers, less than 20 inches deep, and formed from quartz diorite bedrock. Rock fractures enable rooting beyond the apparent solum depth. Surface layers have loam to sandy loam textures and greater than 15% to greater than 35% rock fragments by volume. Subsoils contain greater than 35% to occasionally greater than 60% rock fragments and have clay loam or sandy clay loam textures. Rock fragments are cobble, gravel, or stone-sized (in order of importance) throughout the soil layers. Surface rock and gravel usually exceeds 25% cover.

Variability in soils appears to follow elevational trends regardless of landform type. Soils are about twice as deep at higher elevations where clay concentrations are more common. Soils average 16 to 22 inches (mean: 20 in) at elevations above 2,000 feet and 4 to 11 inches (mean: 9 in.) at elevations of 2,000 feet and below. Sandy loams and loams are more typical at lower elevations while clay loams and sandy clay loams are more common at higher elevations. These differences are due to different rates of weathering. The increased precipitation at elevations above 2,000 feet may be sufficient to favor more rapid weathering of the rock and develop soils more readily.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3 granitics

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
8 in. to 20 in.	5 in. to 9 in.	0	2 in. to 17 in.	stable	57°F to 80°F	0 to 12 in.	20% to 70%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationship - Paired sample plots established near Trail Gulch in the Snake River Canyon of Oregon demonstrate species affinities and differences within this type. The plots were located on contrasting east- west slopes in mid seral AGSP-POSA3 (granite) communities. The easterly plot was about 300 feet higher in elevation with a deeper soil (22 inches vs. 14 inches). A dramatic compositional difference was that arrowleaf balsamroot was restricted to the more mesic easterly slope while skullcap was the principal perennial forb of the drier west-facing slope. Snake River phlox and shaggy fleabane were other perennials restricted to the west aspect. Balsamroot is apparently able to compete better on the mesic portions of AGSP-POSA3 communities and will show substantial increases there. On even more mesic bunchgrass sites where Idaho fescue is associated with bluebunch wheatgrass, increases in balsamroot following site disturbance are more dramatic. Prickly pear is also a principal perennial increaser in this type.

Series Relationship - AGSP-POSA3/OPPO is commonly adjacent to this type on rocky ridges. GLNE/AGSP occurs on steep rocky outcrops and rim palisades. FEID-KOCR (low) may be found on northerly aspects adjacent to the type. AGSP-POSA3/PHCO2 is a key type found in close proximity on basalt slopes. Comparative differentiation between AGSP-POSA3 (granite) and other AGSP-dominated dry types in late and mid seral stages is as follows:

1. big fruited lomatium (LOMA) is the most common desert parsley in the type and occurs more often in this type than others of the AGSP series.
2. lowest surface gravel coverage (mean: 9%) of all AGSP-dominated types
3. highest moss coverage (36%) of all AGSP-dominated types.
4. occurrence on stable granitic substrates
5. common invaders are ARLO3 and SPCR
6. cheatgrass occurrence is higher and more frequent than in all other AGSP-dominated types.

Role of Fire - Bluebunch wheatgrass can withstand a light fire except in dry years when fire may burn deeper into the root crowns where sprouting rhizomes are located. Red three awn and sand dropseed would probably resist damage by light fire. The type may be generally resistant to burning based on spatiality of fuels. Prickly pear is fairly susceptible to fire damage. The spines are burned leaving the fleshy stems vulnerable to grazing ungulates and rodents.

Management Considerations - Cattle preference is for bluebunch wheatgrass. These sites should be managed to promote this species. Sheep tend to utilize succulent annual vegetation and perennial forbs. Utilization by winter-grazing livestock should cease prior to the onset of the boot stage. Invasion by sand dropseed and

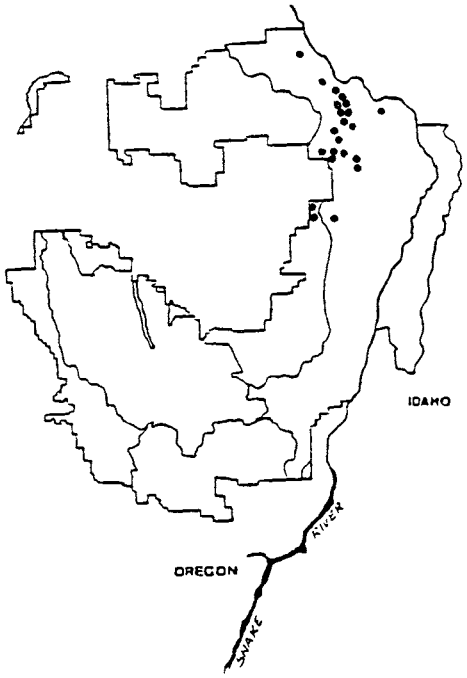
red three awn follows severe over-utilization of perennial bunchgrass vegetation. Cessation of bluebunch wheatgrass grazing at the proper growth period (early May to mid July) should help reduce the invasion by these undesirable species.

Productivity - Total herbage production and production of bluebunch wheatgrass is moderate in comparison to other communities in the bluebunch wheatgrass series. Bluebunch wheatgrass production may decrease significantly in early and very early seral stages. Red three awn, sand dropseed, and forb production increases in these early seral communities. Total herbage production may therefore show little change among seral stages.

Comparison With Other Studies - The AGSP-POSA3 community confined to a granitic substrate has not been previously characterized. This is the only bunchgrass community described on residual granitic soils. Other grassland communities do, however, occur on loess-influenced granitic substrates (i.e., FEID-KOCR).

Bluebunch wheatgrass - Sandberg's bluegrass/Snake River phlox plant association
Agropyron spicatum-Poa sandbergii/Phlox colubrina
(AGSP-POSA3/PHCO2) (GB41 17)

19. Basin Creek Canyon of Imnaha River Canyon (Hells Canyon NRA) *Plot 368*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: basalt colluvium + loess
Elevation: (2500 ft.) 1300-3100 ft.	Solum depth: (26 in.) 20-33 in.
Aspect: (SW) E-W	Loess depth: loess mixed with colluvium
Slope (43%) 15-65%	Root conc: (25 in.) 19-34 in.
Position: mid 1/3 to upper 1/3 slopes,brows, benches	Depth to GT 35% rock frag./size: (15 in.) 3-23 in./gravels,cobbles
Other: intermediate between FEID-AGSP and AGSP sites grass communities	Surface soil/subsoil texture: loamy sand,silt loam/ sandy loam,loam,silty clay loam

Table of Principal Species

AGSP-POSA3/PHCO2 (n = 22)

Mean Foliar Coverage (%)/Constancy (%)

Species	Code	Late Seral (n=4)	Mid Seral (n=10)	Early Seral (n=8)	Late to Mid Seral Range
Grasses					
*bluebunch wheatgrass	AGSP	33/100	26/100	29/100	15-40
*Sandberg's bluegrass	POSA3	5/100	3/80	2/75	0-10
foxtail fescue	FEME	1/25	1/30	-	0-1
cheatgrass	BRTE	1/50	2/80	8/100	0-5
Japanese brome	BRJA	-	3/40	4/38	0-5
Perennial Forbs					
yarrow	ACMIL	4/100	4/100	2/100	1-10
*hairy milkvetch	ASIN2	1/50	5/80	8/75	0-25
horseweed	COCA2	5/25	3/20	12/38	0-5
narrowleaved skullcap	SCAN	2/75	4/50	10/50	0-10
*Snake River phlox	PHCO2	1/75	1/70	2/50	0-3
*hairy golden aster	CHVI2	3/25	3/50	2/38	0-5
*shaggy fleabane	ERPU	1/25	2/70	1/88	0-5
*prickly pear	OPPO	2/75	3/90	5/63	0-10
large fruited lomatium	LOMA	1/50	2/40	1/25	0-3
arrowleaf balsamroot	BASA	1/25	6/40	6/50	0-15
varileaf phacelia	PHHE	1/50	2/60	1/38	0-3
Annual Forbs					
threadleaf phacelia	PHLI	1/75	4/60	10/50	0-10
blue forget-me-not	MYMI	1/75	2/20	3/13	0-3
blepharipappus	BLSC	3/50	2/40	1/13	0-5
thyme leaf sandwort	ARSE	1/50	2/30	10/13	0-3
Indian wheat	PLPA	2/50	2/60	11/50	0-5
common speedwell	VEAR	2/75	2/20	1/13	0-3
branded pepperweed	LERA	-	1/70	4/75	0-3
common cryptantha	CRIN2	1/25	3/40	9/38	0-5
sleepy cat	SIAN2	-	2/70	3/63	0-10
rock		34/100	38/100	50/100	5-60
gravel/pavement		5/25	15/70	2/38	0-55
bare ground		11/100	10/100	14/88	1-15
moss		5/100	17/40	5/63	0-45
litter		33/100	14/100	12/100	1-60
Herbage Production (lbs/acre dry wt.)					
bluebunch wheatgrass		450	700	570	360-790
Other forage species		175	175	160	50-175
total		625	875	730	430-1025

*Principal Indicator Species

Vegetative Composition - Communities of this plant association occur on the most mesic bluebunch wheatgrass sites at lower to mid-elevations in the bluebunch wheatgrass climatic zone. Bluebunch wheatgrass (AGSP) is almost always associated with Sandberg's bluegrass (POSA3). This type is differentiated from other AGSP-POSA3 groups on basalt substrates by having a distinctive union of forbs which define it. This union consists of Snake River phlox (PHCO2), hairy milkvetch (ASIN2), hairy golden aster (CHVI2), and shaggy fleabane (ERPU). Hairy milkvetch is very frequent and with relatively high coverage in this type. It is also a frequent member of the AGSP-POSA3/ASCU4 type.

In early seral stage, bluebunch wheatgrass and Sandberg's bluegrass often decline in cover with annual bromes (BRJA, BRTE) becoming more frequent. Sand dropseed often invades highly disturbed sites. Prickly pear (OPPO), skullcap (SCAN), and hairy milkvetch (ASIN2) may also increase on these sites. Arrowleaf balsamroot is only a minor component in this type but demonstrates increased coverage on poorer condition sites. Important annual forbs are threadleaf phacelia (PHLI), Indian wheat (PLPA), common speedwell (VEAR), common cryptantha (CRIN2), and pepperweed (LERA).

Distribution and Environmental Features - Communities in the AGSP/POSA3/PHCO2 type appear to be confined to the Lower Imnaha watershed. This type occurs on both large colluvial slopes of Yakima basalt flows and on interim slopes, with predominantly colluvial soils, on Imnaha flows. Elevations range from 1,300 to 3,100 feet (mean: 2,500 feet), the second widest range for communities in the bluebunch wheatgrass series. Sites are mostly on the mid-third to upper third of moderate to steep (range 15-65, mean: 43%) east to west-facing slopes. Microrelief of these sites is convex to concave.

Soils - Soils are typically very dark brown to dark brown in color in surface layers, between 20 and 33 inches in total depth, and formed in basalt colluvium with loess influence. Surface layers have silt loam, sandy loam, or loam textures with less than 35% rock fragments by volume. Subsoils have greater than 35% rock fragments and may lack significant clay concentrations. Textures are clay loams, silty clay loams, and sandy loams. Rock fragments tend to be gravel and cobble-sized in surface layers and cobble and stone-sized in subsoil layers. Surface rock usually exceeds 25% cover.

Soils vary considerably in this type because they are derived from often irregular accumulations of colluvium across bedrock slopes. Other factors influencing soil formation are the unstable nature of sites, and the differing influence of loess depositions, displacement and accumulation. The complex interaction between erosional forces, bedrock topography, vegetation cover, and wind deposited materials may mask site differences making patterns less evident. In general, deeper soils occur in accumulation and footslope positions. Clay appears common only in more stable soils. Loess influence is greatest on more leeward slopes nearer to FEID-KOCR communities. This type has one of the deepest mean solum depths in the bluebunch wheatgrass series with the most variability in texture, clay content, and loess influence. To some extent, it can be considered to occupy a zone of transition between bluebunch wheatgrass dominated communities and those communities where bluebunch wheatgrass and Idaho fescue are codominant.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3/PHCO2

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
19 in. to 40 in.	15 in. to 34 in.	0 to 10 in.	2 in. to 24 in.	un- stable	60°F to 68°F	Surface to 31 in.	15% to 75%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Synecological Relationship - Two early seral AGSP-POSA3/PHCO2 communities on contrasting east-west slopes in the Cactus Mountain area were similar in appearance. However, hairy milkvetch (ASIN2) occurred only on the drier southwesterly slopes with Sheldon's milkvetch (ASRES) restricted to the more moisture-retaining easterly slopes. Sheldon's milkvetch consistently occurred throughout the canyonlands as the most drought-intolerant of the milkvetches. The various species of Astragalus often require specific environmental conditions making them good indicators for specific plant communities (Ogden, et al - 1987). The milkvetches of the Wallowa-Snake grasslands do demonstrate affinities to specific plant associations. They may increase, but often will not invade into communities with differing soils or moisture relationships. Moseley (1986) found Sheldon's milkvetch as a prominent member of a late seral Idaho fescue-dominated community on the Camas Prairie in Idaho. This milkvetch may be reaching its ecological limit for drought tolerance on AGSP-POSA3/PHOC2 steep slope sites in the Wallowa-Snake Province.

Series Relationship - AGSP-POSA2/PHCO2 is commonly adjacent to granitic AGSP-POSA3 and AGSP-POSA3/OPPO. FEID-KOCR (low) sites may be found on northerly aspects and buckwheat/twinpod (ERIOG/PHOR) may be found adjacent to this type. SPCR-ARLO3 may also occur on bench and terrace lands near this type.

Comparative differences between AGSP-POSA3/PHCO2 and other AGSP-dominated dry types in mid and late seral stages are as follows:

1. Indian wheat and sleepy cat are more frequently found in interspaces between bunchgrasses of this type
2. greatest frequency of hairy milkvetch and Snake River phlox occurs in this type
3. highest bluebunch wheatgrass production

Role of Fire - Light burning should not affect bluebunch wheatgrass detrimentally, but hot burns should be avoided in the droughty summer months. Milkvetches will also probably not be affected and may even benefit from burning (Mueggler and Blaisdell-1958; Hammersmark-1977; Wagner-1972). Prickly pear colonies decreased by 30% two years after burning in the southwest (Reynolds and Bohning-1956).

Management Considerations - Cattle preference is for bluebunch wheatgrass. Sites should be managed to promote bluebunch wheatgrass where domestic cattle grazing is the major use. Reduction of grazing pressure on bluebunch wheatgrass during the spring flowering-seed set period should permit bluebunch wheatgrass to

maintain its vigor. Sheep will tend to utilize succulent annual grasses and may promote bluebunch wheatgrass with proper herding. Elimination of undesirable species such as hairy milkvetch may be difficult and ineffective.

Productivity - Overall herbage production is high in AGSP-POSA3/PHCO2 communities. Total production exceeds amounts observed in other communities of the bluebunch wheatgrass series. Production of bluebunch wheatgrass may be the highest of all communities in the Province in which it occurs. Bluebunch wheatgrass may increase in production from late to mid seral stages, although, other forage species tend to remain about the same. These differences may be due to yearly climatic fluctuations or minor site differences.

Comparison with Other Studies - AGSP-POSA3/PHCO2 typified by moist-tending sites with a forb-rich composition has not been described elsewhere.

"What you see depends mainly on what you look for."

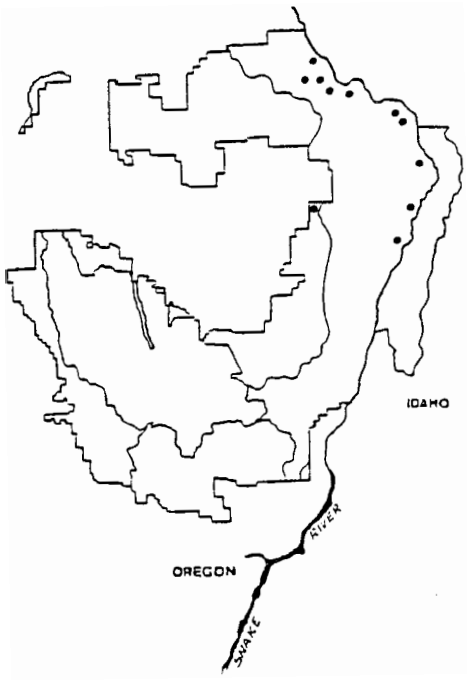
Vogl

Bluebunch wheatgrass - Sandberg's bluegrass/prickly pear plant association

Agropyron spicatum - Poa sandbergii/Opuntia polycantha

(AGSP-POSA3/OPPO) (GB41 18)

20. Sheep Creek Divide, Imnaha River Canyon (Hells Canyon NRA) ***Plot 1109***



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: basalt bedrock
Elevation: (2600 ft.) 1800-3700 ft.	Solum depth: (7 in.) 6-8 in.
Aspect: (S) SSE-SSW	Loess depth: (0)
Slope (50%) 30-75%	Root conc: (6 in.) 4-8 in.
Position: (ridgebrows) mid 1/3 to upper 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/gravels,cobbles
Other: most severe site in AGSP series	Surface soil/subsoil texture: loam/clay loam,clay

Table of Principal Species

AGSP-POSA3/OPPO (n = 11)

Species	Code	Mean Foliar Coverage (%)/Constancy (%) Late Seral (n=5)	Mid Seral (n=6)	Late to Mid Seral Range
Grasses				
*bluebunch wheatgrass	AGSP	18/100	19/100	15-25
*Sandberg's bluegrass	POSA3	1/60	1/33	0-1
cheatgrass	BRTE	2/60	4/100	0-10
rattlesnake brome	BRBR	1/40	6/33	0-10
Japanese brome	BRJA	1/40	3/33	0-5
red three awn	ARLO3	-	2/50	0-5
Perennial Forbs				
yarrow	ACMIL	2/100	3/100	1-5
Snake River phlox	PHCO2	-	1/33	0-1
shaggy fleabane	ERPU	1/60	1/33	0-1
*prickly pear	OPPO	5/100	5/100	1-10
big fruited lomatium	LOMA	1/40	1/33	0-1
whorled penstemon	PETR	2/60	1/50	0-5
skullcap	SCAN	6/80	1/17	0-10
prickly lettuce	LASE	1/40	1/33	0-1
Annual Forbs				
thyme leaf sandwort	ARSE	1/40	2/33	0-3
Indian wheat	PLPA	2/40	1/50	0-3
common speedwell	VEAR	3/20	1/17	0-3
field filago	FIAR	2/60	2/67	0-5
branded pepperweed	LERA	1/20	2/33	0-3
blepharipappus	BLSC	2/60	1/17	0-3
common cryptantha	CRIN2	3/80	3/33	0-5
rock		47/100	19/100	1-70
gravel/pavement		12/60	22/100	0-50
bare ground		3/80	20/100	0-25
moss		25/100	11/67	0-45
litter		4/100	9/100	1-20
Herbage Production (lbs/acre dry wt.)				
bluebunch wheatgrass		285	350	120-600
other forage species		70	55	5-160
total		355	405	200-680

* Principal Indicator Species

Vegetative Composition - Characterizing one of the harshest rocky sites where communities of the bluebunch wheatgrass series occur, AGSP-POSA3/OPPO may be considered an inclusion in the more extensive bunchgrass types. This type consists of bluebunch wheatgrass (AGSP) associated with Sandberg's bluegrass (POSA3), and contains a distinctive prickly pear (OPPO) component. In the late seral stage, bluebunch wheatgrass totally dominates the community on a stable, well-established moss-rock matrix with high moss and limited bare ground surface cover. All other plants average 5% or less in cover. Prickly pear (OPPO), shaggy fleabane (ERPU), and skullcap (SCAN) are the principal perennial forbs. Whorled penstemon (PETR), a rimrock member, is often found associated with the type.

In early seral communities, bluebunch wheatgrass decreases in cover from overuse with a resultant increase in cover by prickly pear. Sandberg's bluegrass cover remains constant in very minor amounts (1% or less). Annuals and moss increase in the bare ground interspaces. The following annuals are prominant in early seral stages: annual bromes (BRTE, BRJA, BRBR), thyme leaf sandwort (ARSE), field filago (FIAR), and Indian wheat (PLPA). Three milkvetches occur within the type: woolly-pod (ASPUG), hairy (ASIN2), and Cusick's (ASCU4). All tend to become more abundant with disturbance. Colonies of prickly pear protect relict bluebunch wheatgrass and Sandberg's bluegrass sites of extreme degradation. Interspaces are then dominated by annuals.

Distribution and Environmental Features - The AGSP-POSA3/OPPO type occurs throughout the Snake River Canyon as far south as Saddle Creek. Elevations range from 1,800 to 3,700 feet (mean: 2,600) the largest range of any community in the bluebunch wheatgrass series. The type also shows the highest variability in preference to parent rock, occurring on Yakima and Imnaha basalt flows, meta-volcanic, and sedimentary substrates. Sites vary from moderately steep to steep (range 30-75; mean: 50), ridges, brows, and inte-rrim locations to gentle saddles and ridgetops. The communities most typically occur on convex surface slopes with southerly aspects. They are thus very hot and dry and represent some of the most exposed rocky sites in the canyon grasslands.

Soils - Soils are typically of dark brown color in surface layers, less than 8 inches in total depth, and formed in basalt; or more rarely metavolcanic or sedimentary bedrock. The thin surface layers have loam textures and greater than 35% rock fragments by volume. Subsoils are usually clayey and have clay loam and clay textures with greater than 35% rock fragments. Gravels and cobbles are the predominant rock materials throughout the soil layers. Surface rock usually exceeds 40% cover.

Sites supporting AGSP-POSA3/OPPO have fairly uniform soils and occur in rocky portions of the landscape. Their slope position and microrelief encourages the shedding of water and increases the probability of erosion. Clayey, rocky subsoils with the protective nature of the surface rock-moss matrix compensate for these factors providing a high degree of stability to these sites. Inclusions of deeper soils may exist where colluvial material has accumulated above rock barriers. Metabasalt and sedimentary parent materials tend to produce deeper soils though they seldom exceed 15 inches in depth. Overall, these sites are the shallowest of all soils capable of supporting bluebunch wheatgrass-dominated communities.

Summary of Soil and Site Characteristics (all samples) - AGSP-POSA3/OPPO

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
3 in. to 10 in.	2 in. to 10 in.	0	1 in. to 9 in.	stable	68°F to 84°F	to surface	30% to 70%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 10 in. depth.

Synecological Relationship - AGSP-POSA3 on shallow-soiled gravelly slopes at mid to low elevation has probably always contained some prickly pear. Typical prickly pear sites are rocky outcrops, rims, or sloping narrow ridges. With disturbance, prickly pear readily colonizes deeper soil bunchgrass sites. This type describes those substrates with shallow, rocky soils where the AGSP-POSA3 community is occupied by prickly pear in the late seral stage. Prickly pear occupying deeper soils or rock-free soils is off-site for this type (i.e., degenerated FEID-KOCR, AGSP-POSA3/PHCO2 and other communities in the bluebunch wheatgrass series). Prickly pear also actively invades bunchgrass granitic substrates.

Series Relationship - In late and mid seral stages, these sites produce the lowest amounts of bluebunch wheatgrass herbage of any of the AGSP-POSA3 group. Above all, the sites are more stable than those found supporting other bluebunch wheatgrass communities. The distinctive shallow, residual soil mantled by mosses among rock outcrops is found in only one other bluebunch wheatgrass type at low to mid elevations -- the AGSP-POSA3 on granitic substrates. AGSP-POSA3/SCAN may also occur on shallow soils, but is restricted to areas with active slope movement. Commonly AGSP-POSA3/OPPO will occur as an inclusion on convex rocky microsites in a more extensive and more mesic bluebunch wheatgrass community. More typically, however, the type occupies lithic inter-rim south-facing slopes and sloping convex ridges where bluebunch wheatgrass bunches are widely spaced and prickly pear and mosses dominate the gravelly interspaces.

This type is differentiated from other bluebunch wheatgrass-dominated associations by the absence of arrowleaf balsamroot. It contains the lowest coverage of bluebunch wheatgrass and Sandberg's bluegrass in late to mid seral stages and has the highest frequency of prickly pear of all types. Occurrence by prickly pear with bluebunch wheatgrass on the shallowest soils with exposed bedrock and relatively high moss coverage further characterizes and separates this type from others.

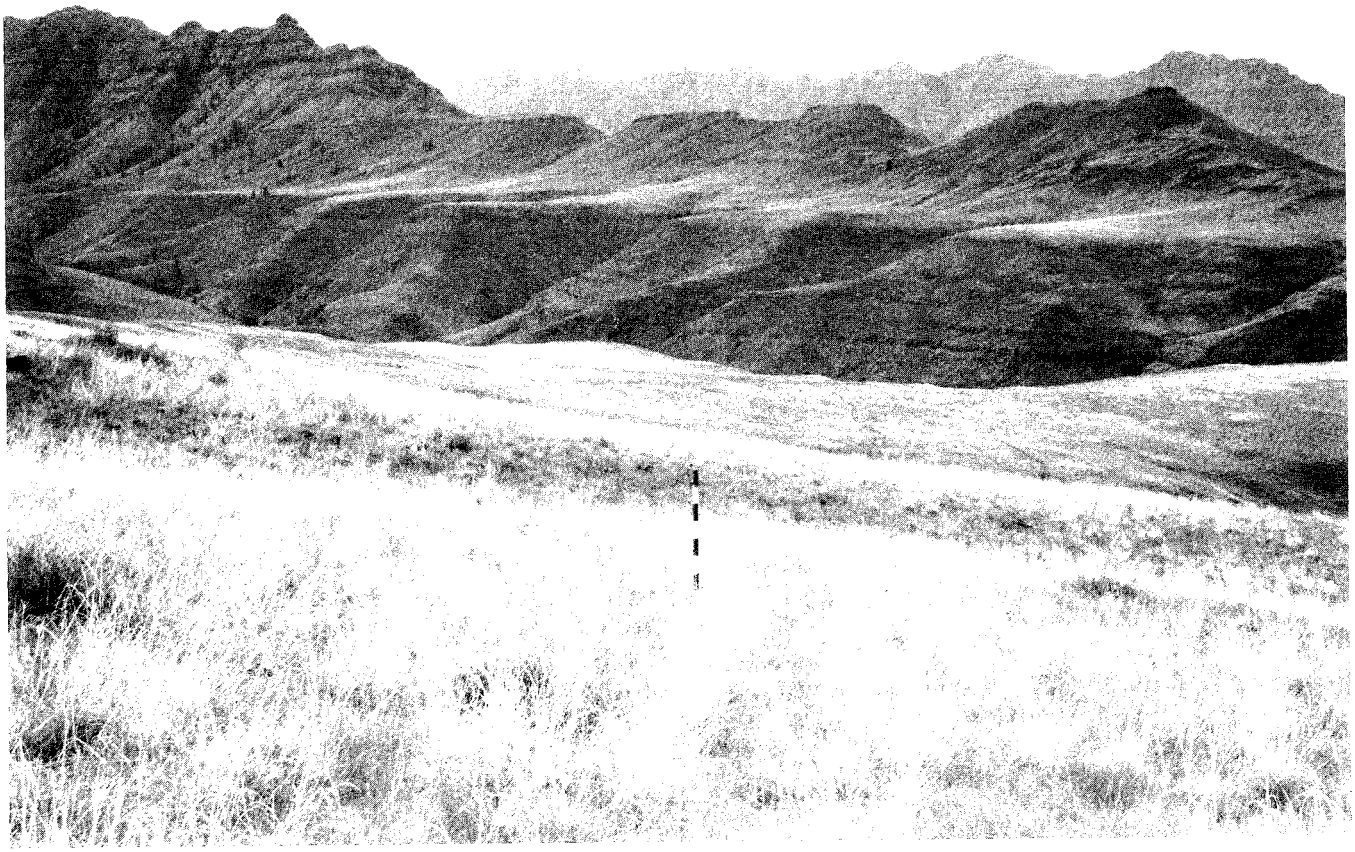
Role of Fire - Bluebunch wheatgrass may be damaged by hot burns in the droughty months of summer and fall when fire can more readily penetrate the root crowns. Lack of fuel and the spatiality of bunchgrasses may present a problem with the use of prescribed fire in this type. Fire has been shown to be a management tool, however, in reducing prickly pear colonies by 30% in the southwest (Reynolds and Bohning-1956). Mortalities were attributed to burning-off of spines followed by rodent and domestic animal grazing of the succulent plants.

Management Considerations - Cattle preference is for bluebunch wheatgrass and therefore these sites should be managed to promote it. Sheep use succulent annual grasses and perennial forbs which may improve the bluebunch wheatgrass abundance on these sites. Reduction of grazing pressure on bluebunch wheatgrass during the spring flowering seed-set period (early May - mid July) has shown dramatic improvement in bluebunch wheatgrass abundance and vigor on some rangelands of the lower Imnaha.

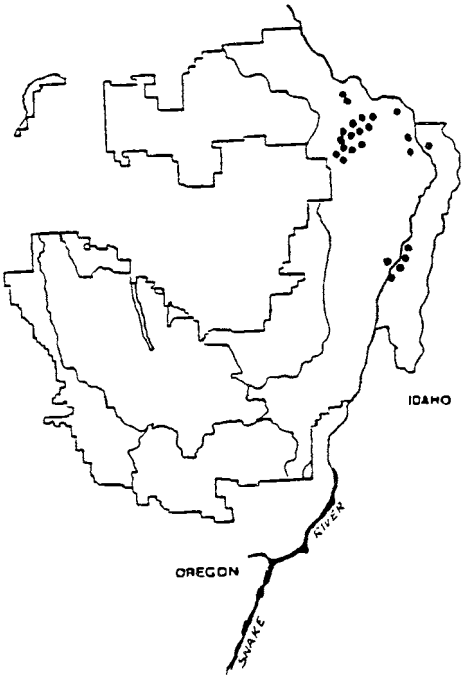
Productivity - Total herbage production and production of bluebunch wheatgrass in late and mid seral communities is among the lowest of all bunchgrass types including many xeric shrub types. Mid and late seral communities produce about equal amounts of forage.

Comparison With Other Studies - AGSP-POSA3 typified by rocky sites supporting prickly pear has been described by Tisdale (1986). His AGSP/OPPO habitat type is essentially the same as the plant association described above.

Bluebunch wheatgrass - sand dropseed - red three awn plant community type
Agropyron spicatum - Sporobolus cryptandrus - Aristida longiseta
(AGSP-SPCR-ARLO3) (GB19 11)



21. Cow Creek Bench, Lower Imnaha Canyon (Hells Canyon NRA) *Plot 332*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA	Parent Material: loess and colluvium-alluvium
Elevation: (2000 ft.) 1200-2500	Solum depth: (42 in.) 30-60 in.
Aspect: all	Loess depth: (3 in.) 0-6 in.
Slope (14%) 1-30%	Root conc: (32 in.) 20-55 in.
Position: footslopes of benches, terraces and alluvial fans	Depth to GT 35% rock frag./size: (16 in.) 0-40 in./gravels, cobbles
Other: covers extensive areas where grazing has been historically high	Surface soil/subsoil texture: silt loam,loam/loam,silty clay loam,clay

Table of Principal Species

AGSP-SPCR-ARLO3 (n = 24)

Species	Code	Mean Foliar Coverage (%) Constancy (%) Mid Seral (n=3)	Early Seral (n=7)	V.Early Seral (n=14)	Total Range
Grasses					
*sand dropseed	SPCR	7/67	11/100	19/86	0-55
*red three awn	ARLO3	5/33	13/43	15/93	0-70
*bluebunch wheatgrass	AGSP	45/100	23/100	4/86	0-55
*Sandberg's bluegrass	POSA3	2/67	4/86	3/64	0-10
annual fescue	FEME,FEMI	6/67	20/57	10/57	0-30
*cheatgrass	BRTE	2/100	10/100	18/100	0-50
rattlesnake brome	BRBR	5/33	3/14	3/43	0-5
Japanese brome	BRJA	3/33	7/57	10/57	0-25
Perennial Forbs					
yarrow	ACMIL	2/100	2/100	4/50	0-10
*shaggy fleabane	ERPU	1/100	3/100	2/21	0-10
prickly pear	OPPO	1/33	5/71	2/36	0-15
yellow salsify	TRDU	1/67	2/29	2/29	0-5
*goatweed	HYPE	5/33	6/57	4/43	0-15
hairy milkvetch	ASIN2	1/33	4/57	2/43	0-10
Annual Forbs					
*thyme leaf sandwort	ARSE	10/33	3/29	5/50	0-10
Indian wheat	PLPA	8/67	4/71	8/64	0-40
common speedwell	VEAR	-	1/29	5/50	0-25
blue forget-me-not	MYMI	-	1/29	1/43	0-1
*filaree	ERCI	15/33	6/71	5/93	0-30
rock		17/67	12/57	2/64	0-30
gravel		30/33	1/43	1/14	0-30
bare ground		25/67	9/100	9/86	0-30
moss		22/100	27/100	24/71	0-60
litter		30/67	28/100	35/100	0-90
Herbage Production (lbs/acre dry wt.)					
bluebunch wheatgrass		330	20	80	20-410
sand dropseed		45	40	100	0-360
red three awn		75	0	170	0-260
other species		205	220	255	50-380
total		655	280	605	300-690

* Principal Indicator Species

Vegetative Composition - This plant community type represents large areas of terraces, alluvial fans, and benchlands in the lower canyons where intense grazing has substantially altered the natural plant community composition. Gentle slopes of the Lower Imnaha structural benches, terraces along the Snake River, and other undulating slopes of the deep canyons often are found with a significant sand dropseed (SPCR) and red three awn (ARLO3) composition. These communities have resulted from repeated intensive ungulate usage. In most cases, the sites are too dry and hot to support Idaho fescue as part of the potential plant community. The probable climax for most of these sites would be a community dominated by bluebunch wheatgrass, Sandberg's bluegrass, and other dry site perennial forbs. No community was encountered representing such an AGSP-dominated composition. A portrayal of the best representation of potential on these benches is a mid seral AGSP-POSA3 community invaded by sand dropseed, red three awn, and often goatweed (HYPE). Other associated plants common to this mid seral community are annual fescues (FEME, FEMI) yarrow (ACMIL), shaggy fleabane (ERPU), and Indian wheat (PLPA).

Early seral stands would still contain bluebunch wheatgrass, but at about half the coverage, while sand dropseed and red three awn double to dominate over bluebunch wheatgrass. Sandberg's bluegrass (POSA3) is present and tends to increase. Annual grasses (especially cheatgrass and annual fescues) increase dramatically. Perennial forbs are relatively minor constituents. Occurring at low coverage levels are shaggy fleabane (ERPU), prickly pear (OPPO), purple-flowered milkvetches (ASIN2, ASPUG), and moth mullein (VEBL).

Very early seral SPCR-ARLO3 communities do not contain bluebunch wheatgrass or it is present only as a relict. Sand dropseed tends to increase under increased pressure from the grazing animal. The non-palatable red three awn may ultimately assume dominance of the site. Annuals are abundant throughout the stands. Increasing species in these communities are filaree (ERCI), blue forget-me-not (MYMI), prickly lettuce (LASE), annual bromes (especially BRJA, BRTE), and common speedwell (VEAR). Goatweed steadily increases on very early seral communities and may dominate as a zootic disclimax.

Distribution and Environmental Features - The AGSP-SPCR-ARLO3 communities are confined to sites with deep colluvium deposited over river terraces and structural benchland in the Lower Imnaha and Snake River Canyons at low elevations. Elevations range from 1,200 to 2,500 feet (mean: 2,000), one of the lowest elevation communities found on the Wallowa-Whitman National Forest. Sites are on benches or more commonly on gentle foot slopes (slope range 1-30%, mean: 14%), above bench and terrace flats having variable aspects. Surface microrelief is smooth, convex, or undulating.

Soils - Soils are typically very dark brown in color in surface layers, greater than 30 inches deep, and formed in colluvium and/or alluvium derived from predominantly basalt rock. Surface layers have silt loam or loam textures with less than 35% rock fragments by volume. Subsoils have greater than 35% rock fragments and clay loam or loam textures. Rock fragments tend to be gravel-sized in surface layers and gravel and cobble-sized in subsoil layers. Surface rock seldom exceeds 10% cover.

Soils are highly variable due to the presence of different depositional sequences on the sites, types of parent material, and source of colluvium or alluvium. The amount and kind of rock material varies greatly. Soils may range from deep, nearly rock-free, coarse, ashy layers to those with greater than 60% rock fragments by volume. Deeper soils are usually associated with metavolcanic or sedimentary deposits although basalt colluvium and loess may accumulate to greater than 60 inches in toe slope situations. Loess may be mixed throughout the soil layers, but does not occur as a distinct cap as is common in FEID-KOCR soils. Clay concentrations are more likely on older stable depositional areas and often forms very compacted soils where historic grazing pressure has been intense. Soils in the AGSP-SPCR-ARLO3 type are among the deepest of all those associated with bluebunch wheatgrass dominated sites.

Summary of Soil and Site Characteristics (all samples) - AGSP-SPCR-ARLO3

Solum Depth*	Rooting Depth**	Loess Depth	Surface Soil depth	Site Stability	*** Summer Temp.	Depth to 35% rock fragments	%Surface rock frag.
25 in. to 60 in.	20 in. to 50 in.	0 to 6 in.	4 in. to 36 in.	very stable	55°F to 76°F	0 to 47 in.	0% to 30%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationships - The location of this plant community type on broad, flat, or gentle sloping topography near high forage-producing bluebunch wheatgrass and Idaho fescue slopes made these sites highly vulnerable to a large number of domestic animals during earlier ranching periods. Intensive grazing in early spring and again in the fall by these domestic livestock hastened degeneration in this community. Grazing preference was to bluebunch wheatgrass. When it is grazed heavily in the critical spring developmental period, regrowth is often thwarted during the summer drought period. Animals returning to winter grazing ranges in the autumn again made a heavy impact on the bluebunch wheatgrass fall re-growth which further reduced plant reserves and vigor. This grazing intensity and periodicity over time substantially reduced bluebunch wheatgrass and allowed red three awn and sand dropseed to assume dominance. Red three awn and sand dropseed increase as a result of:

1. later initiation of growth of these warm season grasses in spring, making them unavailable when cattle are active on the site;

2. low palatability of the red three awn allowing it to out-compete the more palatable seral dropseed; and

3. absence of fall regrowth of red three awn and sand dropseed, promoting bluebunch wheatgrass as the preferred and more palatable plant after fall rains.

Sand dropseed probably occurs in a climax plant association on sandy soils bordering the Snake and Imnaha Rivers. Red three awn was probably a primary succession species on talus slopes, gravel bars, and immature alluvial soils (Evans and Tisdale - 1972).

Synecological Relationship - These communities are most similar to AGSP-POSA3 low elevation types. The AGSP-POSA3/OPPO, AGSP-POSA3/PHCO2, and AGSP-POSA3/granite types all contain sand dropseed and red three awn in some lower seral communities. Sand dropseed declines in very early seral communities of these types after an initial increase resulting from lower vigor or loss of bluebunch wheatgrass. The red three awn plants, being so unpalatable and coupled with the later phenologic period, are able to assume dominance in a zootic disclimax where no palatable decreasers or increasers remain. In these situations, sites capable of supporting AGSP-POSA3 communities may have species compositions dissimilar to the AGSP/POSA3 types defined by this study. No AGSP-POSA3 communities have been described on deep colluvium in bench and terrace areas; a site nearly unique to AGSP- SPCR-ARLO3. If these terraces and benchlands are potentially capable of supporting communities with a more typical AGSP-POSA3 composition, these sites would still be considered a unique AGSP-POSA type to those described in this study.

Role of Fire - Little information is documented about sand dropseed and red three awn response to fire. A study in Utah (Christensen - 1964) of SPCR-ARLO3-dominated communities compared pre-fire composition with subsequent community composition changes following six years of repeated summer fires. Both red three awn and sand dropseed declined over the six-year period while cheatgrass increased dramatically. Since bluebunch wheatgrass was not a part of this community, its response in these communities is still unknown, but may be similar to that reported in other AGSP-dominated types.

Management Considerations - Improvement of bluebunch wheatgrass vigor, and its re-establishment in degraded areas, will improve site utility and productivity. Removal of grazing pressure at the critical spring phenologic period may help promote bluebunch wheatgrass vigor, flowering, and seed dispersal. Diversity can be maintained by holding communities at a mid-seral level where sand dropseed and bluebunch wheatgrass are codominant with only minor red three awn composition. This may enhance the utility of the range by providing spring bluebunch wheatgrass feed and early summer sand dropseed feed. If cattle are removed prior to onset of bluebunch wheatgrass flowering and not put on until fall, the sand dropseed should be available following culm-softening by fall rains along with bluebunch wheatgrass regrowth. Sand dropseed is palatable to all ungulates and provides fair to good winter forage. Red three awn is not considered palatable except on the most over-utilized pastures when starvation is imminent.

Productivity - Total herbage production and production of bluebunch wheatgrass is moderate in mid and early seral communities of this type. However, along with the sand dropseed climax plant association, no other types produce as much read three awn or sand dropseed. Production of bluebunch wheatgrass will decrease significantly in the early seral stage and may be virtually nonexistent in very early seral communities. At the same time, red three awn and sand dropseed more than double in very early seral communities. Other species, notably annuals, also increase substantially. As a result, total production may be greater in very early seral communities.

Comparison With Other Studies - Daubenmire (1970) defined a SPCR-POSA3 habitat type and an ARLO3-POSA3 habitat type. He felt both resulted as a result of edaphic abnormalities in the AGSP-POSA3 zone. With the exception of sand dropseed sandy river terraces, site and species compositional data do not tend to segregate these two species into unique types in the Wallowa-Snake Province. Tisdale (1980) also classified SPCR-POSA3 and ARLO3-POSA3 into community types

based on his uncertainty as to their probable climax composition. This AGSP-SPCR-ARLO3 plant community type closely approximates his two types as described. He may have included sites in his two types which are assignable to the sand dropseed climax plant associations of this study; however, since he did not segregate a similar entity in his work.

Tisdale (personal communication, 1985) states that ranchers in the Slate Creek area attempted to control red three awn using fire over a period of several years in the early 1960's. Although some damage occurred to the bunches, there was little mortality with all stands returning to their original condition in a couple of years. Preliminary indications in burned AGSP-SPCR-ARLO3 communities following the 1986 fires are that red three awn and sand dropseed were little damaged or enhanced.