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Forest Habitat Types of Eastern Idaho-Western Wyoming

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THE AUTHORS

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Specialists in other fields provided supplementary information. Dr. Douglass M. Henderson (University of Idaho), Peter F. Stickney (Intermountain Station), and Klaus Lackschewitz (University of Montana) helped identify several difficult plant taxa. Dr. Marcia Wicklow-Howard (Boise State University) and Roger Rosentretor (University of Montana graduate student) identified lichens collected in our sample plots. Likewise, Alma Steele (Boise Public Schools) identified numerous mosses and Dr. Won Shic Hong (College of Great Falls) named the liverworts. James Clayton (Intermountain Station) and Jeff Lelek (University of Montana) identified soil parent materials.

RESEARCH SUMMARY

A land-classification system based upon potential natural vegetation is presented for the forests of eastern Idaho-western Wyoming. It is based on reconnaissance sampling of about 980 stands. A hierarchical taxonomic classification of forest sites was developed using the habitat type concept. A total of six climax series, 58 habitat types, and 24 additional phases of habitat types are defined. A diagnostic key is provided for field identification of the types based on indicator species used in development of the classification.

In addition to site classification, descriptions of mature forest communities are provided with tables to portray the ecological distribution of all species. Potential productivity for timber, climatic characteristics, surface soil characteristics, and distribution maps are also provided for most types. Preliminary implications for natural resource management are provided, based on field observations and current information.

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Forest Habitat Types of Eastern Idaho-Western Wyoming

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INTRODUCTION

The forests of eastern Idaho and western Wyoming occupy an area of complex geology, varied climatic patterns, and merging floras. The resulting vegetation is a diverse mosaic confounded by periodic disturbance. Yet those who administer these lands must reduce this diversity into manageable units. Situations such as this have led people to classify forests for specific purposes, but unfortunately a classification designed for one purpose rarely suits another. A forest serves many needs, therefore its managers should have a classification system that is not structured for one purpose but rather one that serves a variety of management needs.

Classifying forest land by habitat type has proven useful in forest management and research; application has expanded rapidly over the last decade (Layser 1974). Classifications have now been developed for about 20 areas in the western United States (Pfister 1976). This increasing use reflects recognition of the need to emphasize management of ecosystems rather than individual resources. Specialists in different resources also recognize the need to have a common medium for communication, management, and research.

The first habitat type system of site classification was developed over a 20-year period by Daubenmire (1952) for the forests in northern Idaho and eastern Washington. Later, R. and J. Daubenmire (1968) refined their original system. Since then, their approach has served as a model for classification of other areas.

Within the eastern Idaho-western Wyoming area, three earlier studies had provided classification for parts of the area. Reed (1969) defined five rather broad habitat types in the Wind River Range of Wyoming. Cooper (1975) covered the Teton division of the Bridger-Teton National Forest, most of the Targhee National Forest, Yellowstone National Park, and Grand Teton National Park. Henderson and others (1976 unpubl.) developed a habitat type classification for northern Utah, which extended into southeastern Idaho. Still much of the eastern Idaho-western Wyoming area had not been covered and the three existing studies needed to be consolidated into an overall habitat type classification.

In 1976, the Intermountain Region and the Intermountain Forest and Range Experiment Station of the USDA Forest Service began a cooperative study to classify forest habitats in eastern Idaho and western Wyoming. That summer, two field crews (led by Steele and Ondov) sampled areas on the Bridger-Teton, Caribou, and Targhee National Forests not covered in the previous studies and did some additional sampling in areas previously covered. Data from this sampling were combined with data from the previous studies in the area and a preliminary classification (Steele and others 1977 unpubl.) was developed and field tested. In 1978, the same two crews sampled the Shoshone National Forest and did more fill-in sampling in the remaining area. Also, a third crew (led by Cooper) sampled the Wind River Indian Reservation, which borders the Shoshone National Forest. Data from: (1) these samplings, (2) Cooper's (1975) thesis, (3) Reed's (1969) thesis, (4) Henderson and other's (1976 unpubl.) stands and (5) selected stands in central Idaho (Steele and others 1981), Montana (Pfister and others 1977) and Wyoming's Bighorn Mountains (Hoffman and Alexander 1976) were combined for analysis and classification of habitat types in a second preliminary classification (Steele and others 1979 unpubl.) and in this report. Only data from within the study area, however, were used in the charts and tables presented herein.

The area covered by this classification extends roughly from Monida Pass on Interstate 15 in Clark County, Idaho, southwestward to the Utah and Nevada borders, and eastward through the contiguous forests of Wyoming (figs. 1, 2). Isolated forests farther east in the Bighorn Mountains (Hoffman and Alexander 1976) and Medicine Bow Mountains (Wirsing and Alexander 1975) have been previously classified. The isolated forests in Owyhee County, Idaho, are inadequately sampled for inclusion in this classification and possibly relate to unsampled forests to the south and west. Other adjacent areas have been treated in previous studies (Pfister and others 1977; Henderson and others 1976 unpubl.; Steele and others 1981). This study includes most of the land in four national forests, part of one other national forest, two national parks, one Indian reservation, and adjacent forest land regardless of ownership. Floodplains dominated by broadleaved trees and communities dominated by *Juniperus osteosperma* or *Acer grandidentatum* are not included. Likewise, pure stands of *Populus tremuloides*, which are described by Youngblood (1979), are only noted herein at the series level.

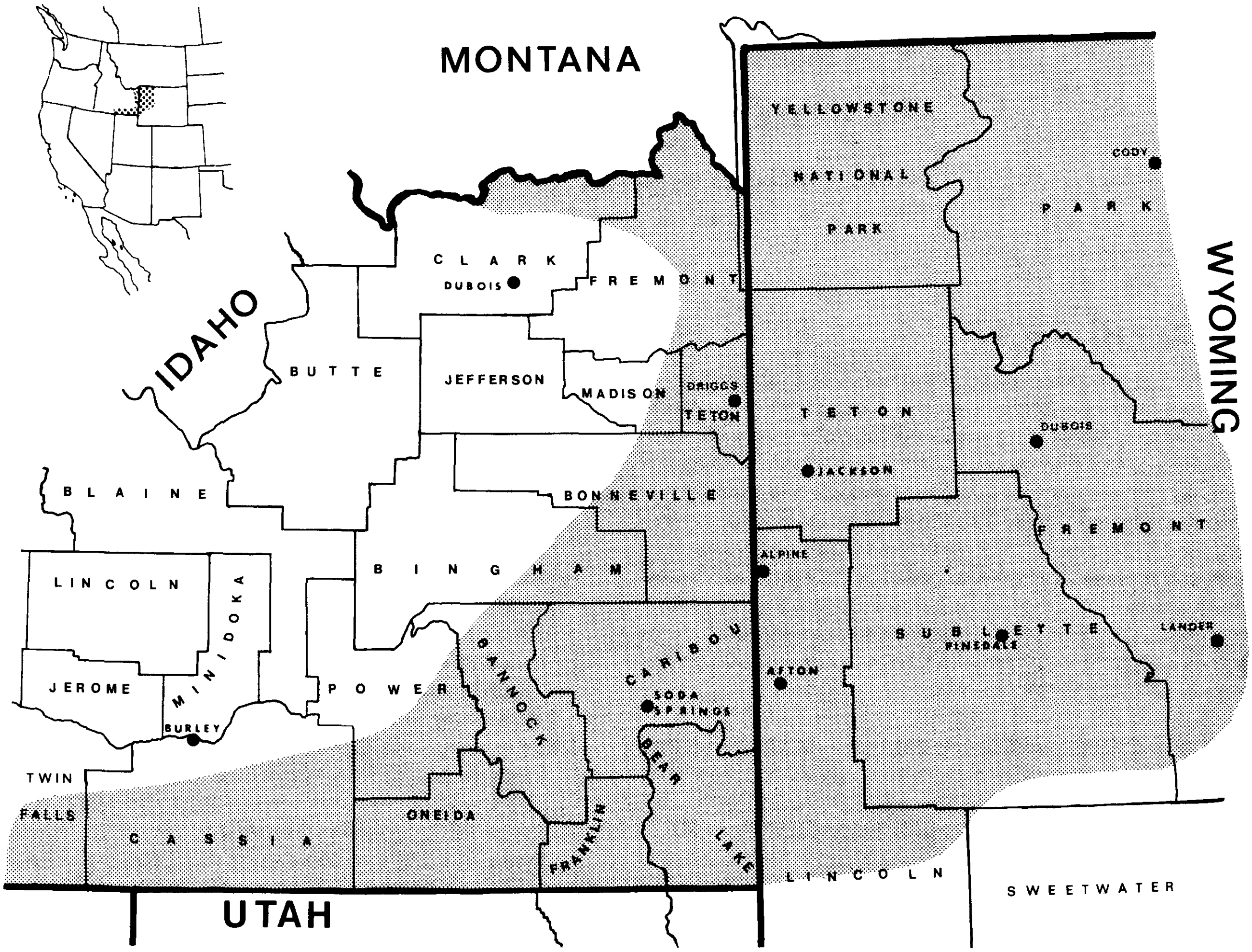


Figure 1.—Area covered by this classification (shaded) showing States, counties, and some towns.

Objectives and Scope

The objectives of this study were:

1. To develop a habitat type classification for the forested lands of eastern Idaho and western Wyoming based on the potential climax vegetation.

2. To describe the general geographic, topographic, climatic, and edaphic features of each type. (See glossary in appendix G for definitions.)

3. To describe the late seral and climax plant communities characteristic of each habitat type.

4. To provide information on successional development, timber productivity potential, and other biological observations of importance to land managers.

5. To further develop and test a reconnaissance-plot method of data gathering (Pfister and Arno 1980) that allows development of a habitat type classification with minimum time and cost.

METHODS

Field Methods

The objective of collecting field data was to efficiently sample a full range of environmental conditions in eastern Idaho and western Wyoming forests. Random and systematic sampling procedures were rejected as inefficient and impractical for this study. The approach we used is similar in concept to the "subjective without preconceived bias" method supported by Mueller-Dombois and Ellenberg (1974). This method was applied to all three steps of plot

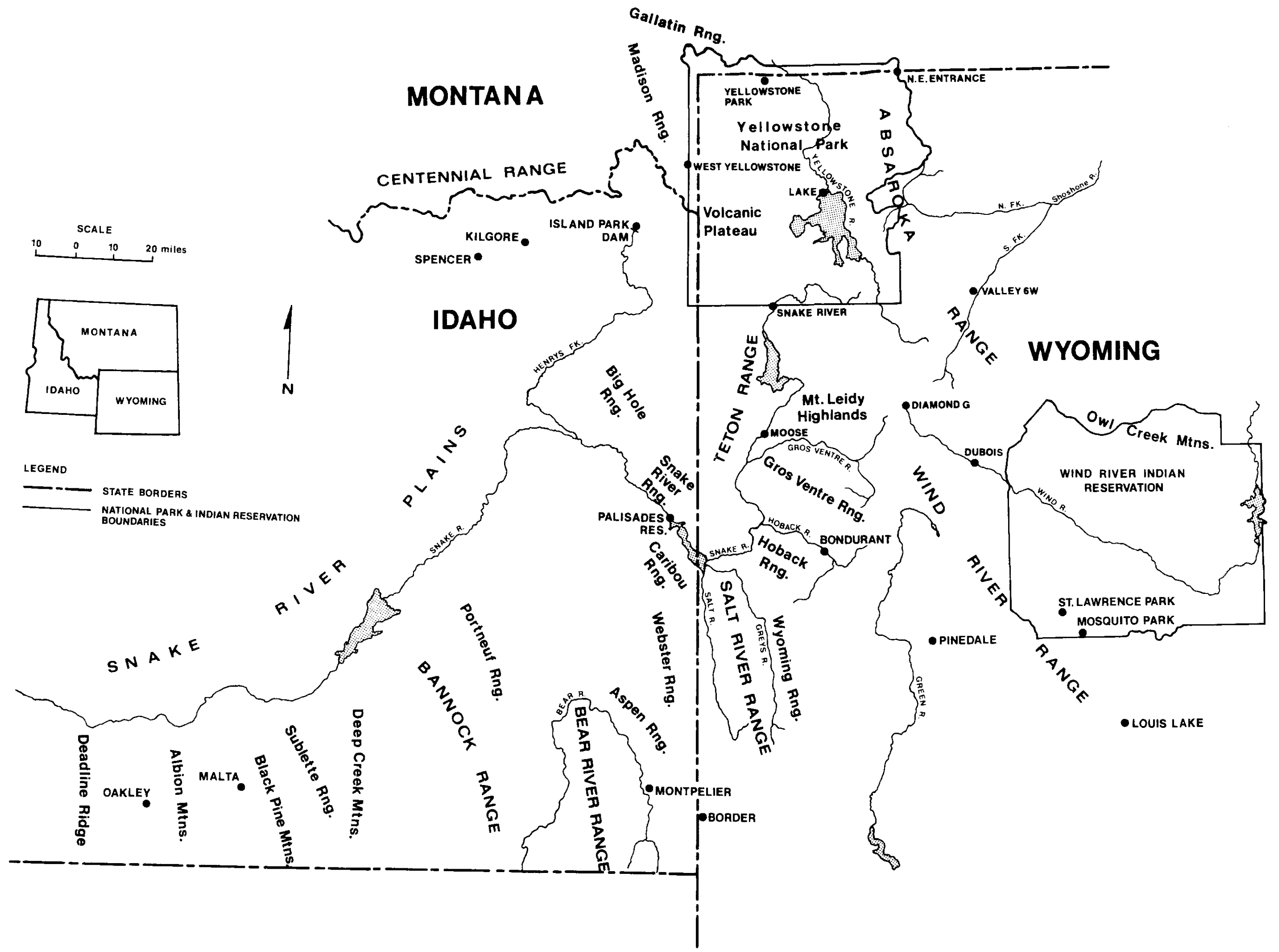


Figure 2.—Area covered by this classification showing major mountain ranges, drainage patterns, and selected weather stations.

location: (1) selecting road transects, (2) selecting stands, and (3) placing the plot within the stand. With this approach, plots were not selected by the probable placement of a stand within any classification nor by apparent applicability to specific management problems.

Elevational road transects were selected to reflect the range of environmental conditions found in the forest. Usually the team leader made note of possible sampling sites as he reconnoitered the transect. Brief stops were made to inspect undergrowth composition. The overstory and general undergrowth patterns were observed en route. On the return trip, mature stands that best represented the different kinds of plant communities for that transect were selected for sampling.

Plots were located within a homogeneous portion of selected stands to provide a representative sample. To do this, the team leader examined the stand from the road. For uneven-aged stands, the largest tree or group of trees in the stand was chosen as the plot center. For even-aged stands the plot was centered in the largest homogeneous expanse of tree canopy. Upon reaching plot center, the surrounding area was examined to insure that the sample plot would, in fact, represent the stand. If the sample plot included ecotones, obvious microsites, or severe disturbance, it was relocated to avoid those conditions.

Plot center for a 375 m^2 (0.093 acre) circular plot was marked with a labeled wooden stake. The plot center was referenced to roadside features to enable revisitation during the study.

Trees more than 4.5 feet (1.4 m) tall were tallied by 2-inch d.b.h. classes according to species. Trees 0.5 to 4.5 feet (0.15 to 1.4 m) in height were recorded by species in a 50 m^2 (0.012 acre) circular plot.

Amounts of all vascular plant species were estimated by seven canopy-coverage classes (+ = present in stand but not in plot, T = 0–1% coverage, 1 = 1%–5%, 2 = 5%–25%, 3 = 25%–50%, 4 = 50%–75%, 5 = 75%–95%, 6 = 95%–100%). For maximum efficiency, these coverages were estimated within the entire 375 m^2

(0.093 acre) plot instead of the usual series of small quadrats (Daubenmire 1959). With practice and coordination among the samplers (including practice layouts within the plot representing areas of 1%, 5%, and 25%), it is possible to visualize and reliably estimate coverage of all the plants by this one method. Accuracy may be somewhat less than where coverages are estimated in small quadrats, but the number of stands sampled in a day can be at least doubled, thus providing better sample coverage of the region. These coverage-class estimates can be used directly in association tables or ordinations.

All unidentified plants on each plot were collected and preserved for later identification or verification. Many plants in flower were also collected for voucher specimens and deposited in the herbarium of the Intermountain Forest and Range Experiment Station at Boise (BOIS).

A relatively free-growing tree of each species present was measured for height, age, and diameter in order to estimate site potential by species. Suitable site trees for each species were not always available, especially in dense stands. In those cases, no site data for those species were collected.

Plot aspect was measured with a compass to the nearest 5 degrees. Degrees of slope and tree heights were measured with a clinometer; altitudes were estimated with a pocket altimeter or from USGS 7½- or 15-minute topographic maps.

Thicknesses of litter, fermentation, and humus layers were averaged from measurements at three random locations in the plot. Samples of the upper 20 cm (ca. 8 inches) of mineral soil were collected for laboratory analysis of percentage of coarse fraction and pH. Samples of the parent material were also collected when available.

Observations were made on fire history, insect and disease occurrence, animal use, and the topographic and soil moisture relationships of the sampled stand to adjoining stands. This latter observation proved valuable during analysis of relationships between plant community types and environmental gradients.

Office Methods

Development of the classification followed the general procedures outlined below.

1. Immediately after each field season, possible types were listed based on our field observations. New situations not conforming to previous classifications from adjoining areas were noted and briefly described.

2. Voucher specimens of plants were identified and some were sent to other herbaria (ID, MRC, MONTU) for verification. Unknown vegetative material was compared with identified specimens. All positive identifications were entered on the field forms. Each species with occurrence in five or more stands was numerically coded. All plot data were then key-punched for computer processing.

3. Computer printouts of synthesis tables (Mueller-Dombois and Ellenberg 1974) were made from the data available for our area. Some data from similar studies in adjacent areas were also included in initial analyses and later omitted. Separate tables were prepared for each series (all stands having the same climax-dominant tree species). Stands were arranged according to general similarities of vegetal composition and relationships to existing classifications from adjacent areas. The synthesis tables were studied in detail and those species that showed consistent differential distributions were underlined. Synthesis tables were rearranged several times to group those stands most similar in overall composition and to segregate groups with consistent differences. The final arrangement provided the formal basis for deriving series, habitat types, and phases.

4. Characteristic vegetational parameters for the plant associations were then identified and briefly described; from this, a parallel key to the habitat types was constructed. This key was then applied to all plot data on hand. The descriptions and key were revised to accommodate individual stand data.

5. Constancy and average cover values were calculated for the important indicator plants following the previous adjustments. A complete presence list was prepared for all vascular plants represented in at least five stands to allow further evaluation of species distributions.

6. The habitat type names were adjusted to compare as directly as possible with those of R. and J. Daubenmire (1968), Pfister (1972a), Cooper (1975), Wirsing and Alexander (1975), Hoffman and Alexander (1976), Henderson and others (1976, 1977 unpubl.), Pfister and others (1977) and Steele and others (1981), and to express the interrelationships of types as clearly as possible. The phase was used to subdivide habitat types based on consistent vegetational differences. In some cases, a phase represents a portion of a habitat type, with some characteristic of an adjacent habitat type; for example, *Abies lasiocarpa/Vaccinium globulare* habitat type, *Vaccinium scoparium* phase. Phases may also distinguish geographic subdivisions of types having very wide distributions; for example, *Pseudotsuga menziesii/Acer glabrum* habitat type, *Pachistima myrsinites* phase.

7. The preliminary classifications (Steele and others 1977, 1979 unpubl.) including descriptions of each type were presented at training sessions in 1977 and 1979 and promptly put into use. Evaluations by the users were solicited, and reported problems sometimes revealed situations that needed more sampling.

8. Data from this later sampling were combined in this report. Pertinent data from all studies were included when developing synthesis tables, redefining types where necessary, rewriting the keys, checking all stands against the classification, and mutually agreeing on the types and phases. About 4 percent of our sample stands did not fit the resulting classification. These stands apparently represent ecotones, vegetational mosaics, unusual seral com-

munities, very dense stands with little undergrowth, or unique associations. It is also possible that some may reflect local habitat types for which we have insufficient data.

9. A map showing the known locations of each habitat type (dots) was prepared using data from all studies within the area and supplemental data from several cooperators who were using the preliminary classification for other field studies (see acknowledgments). As these distribution maps became more complete, the affinities of a habitat type to regional climatic, geologic, or floristic patterns became more evident and helped improve our understanding of each classified unit. Arrows were used on some maps to indicate when a habitat type occurs beyond the study area.

10. A description was prepared for each defined habitat type, including a general discussion of physical environmental features, geographic distribution, key vegetational features, descriptions of phases and basis for their recognition, and general implications for management.

11. This classification can serve as a foundation for developing "site-specific" management implications and future research studies. One of the key management implications developed in conjunction with this study is an appraisal of timber productivity which is included in the discussion section. Understanding the environmental and vegetational features of each habitat type can provide general guidance for many other management questions. Some of the more obvious interrelations applicable to management are noted in the habitat type descriptions and the discussion section.

Taxonomic Considerations

Most plants were identifiable to species, but a few vegetative specimens remain unidentified. Voucher specimens were collected during the course of stand sampling and are deposited in the herbarium of the Intermountain Forest and Range Experiment Station at Boise (BOIS). Taxonomic nomenclature follows Hitchcock and Cronquist (1973). Species not covered in that treatment follow Harrington (1954).

Special attention is needed to distinguish *Pinus albicaulis* from *P. flexilis*. Cones of *P. albicaulis* are purplish and disintegrate on the tree, leaving mainly detached scales on the ground. Cones of *P. flexilis* turn from green to brown and remain intact on the ground for a few years. *P. flexilis* occurs throughout most of the study area at lower elevations of the forest zone and extends upward on the warmer exposed aspects. *P. albicaulis* is more common in the northern half of the study area and becomes scarce on the Caribou National Forest. It occurs mainly at upper elevations of the forest zone and extends downward on the cooler aspects. Occasionally, as in the Wind River Mountains, the two species overlap in their elevational distributions, but even here much of the population is separated by specific site conditions. (See descriptions of *PIAL* and *PIFL* series.)

It is sometimes difficult to distinguish *Picea engelmannii* from *P. glauca*. Ovuliferous cone size and cone scale morphology offer the most reliable and accessible characters for species delineation and provide an index to the degree of hybridization. Cones of *P. engelmannii* are generally 4 to 5 (occasionally 6) cm (1.6 to 2 (occasionally 2.4) inches) long. Their orbicular to oval scales are broadest near the mid-point and have a wavy irregular margin along the tip. Cones of *P. glauca* are 2.5 to 3.5 (occasionally 6) cm (1 to 1.4 (occasionally 2.4) inches) long. Their scales are broadest distally beyond the mid-point and have nonwavy entire margins. The single most easily obtained discriminating character is the absolute length of free scale (distance from the tip of the seed wing imprint to the scale tip); *P. glauca* has a free scale length of 2.8 mm (0.110 inches) or less, whereas that of *P. engelmannii* is 2.9 mm (0.114 inches) or greater (Daubenmire 1974). It is often stated that 1-year-old twigs of *P. engelmannii* are finely pubescent whereas those of *P. glauca* are not. This characteristic is not consistent with the above description of cone characteristics for a number of populations in the study area. Twig pubescence as an important diagnostic character should be discounted.

In Montana, Pfister and others (1977) found that most populations of *Picea* contain hybrids of *P. engelmannii x P. glauca*. The degree of hybridization varies from almost none to a rather even mix, but *P. engelmannii* traits tend to predominate. In the Bighorn Mountains east of the study area, these hybrid conditions are strongly expressed but the *P. glauca* traits gradually decrease toward the north and west, and south to about the Wind River Range. It is in this area of hybridization that *Picea* appears on notably dry habitats and *Picea* habitat types are most extensive.

Picea pungens occurs in several parts of the study area but shows no evidence of hybridization with either *P. glauca* or *P. engelmannii* (Daubenmire 1972). *P. pungens* is rather easily distinguished from trees approaching *P. glauca* by its greater cone length, which ranges from 4 to 10 cm (1.6 to 3.9 inches), with a usually cited length of at least 6.0 cm (2.4 inches), and by its truncate-diamond shaped cone scale, the widest point of which is much below the middle. Separation of *P. pungens* from *P. engelmannii* is best accomplished by comparing shape of cone scales, as described above, and length of free scale. The free scale of *P. pungens* extends more than 7.3 mm (0.29 inches) beyond the seed wing imprint, whereas the imprint tip to scale tip distance in *P. engelmannii* is less than 7.3 mm (0.29 inches). With age, *P. pungens* also develops a fissured bark whereas the bark of even large *P. engelmannii* remains scaly. *P. pungens* occurs in minor amounts on the flood plains and river bottomlands in the Snake River drainage from about Palisades Dam in Idaho upstream into Wyoming and in the Green River drainage of Wyoming. Individual trees may also be found on slopes well above the bottomlands, but the extensive populations mapped in Idaho by Little (1971) were not encountered.

Stickney (1972 unpubl.) found that essentially all of the *Vaccinium globulare* and *V. membranaceum* material collected in Montana would best be labeled *V. globulare*. Using shape of flowers as the diagnostic feature, it appears that most flowering material observed in central Idaho also best conforms to *V. globulare* (Steele and others 1981). Only a small amount of flowering material was found in the study area, but this also fits *V. globulare*. Thus for the sake of uniformity we have chosen *V. globulare* as the epithet for the entire complex within the study area.

Symphoricarpos albus and *S. oreophilus* are sometimes confused unless certain features are noted. The 1- to 3-year-old stems of *S. albus* when sliced obliquely with a sharp knife show a small but definite hole running through the pith; the shrub is rhizomatous, creating continuous colonies. Stems of *S. oreophilus* have a solid pith and the shrub is nonrhizomatous causing it to grow as individual clumps. In the study area, *S. albus* grows mostly on stream terraces, moist areas, and fine-textured soils, whereas *S. oreophilus* is widespread and often abundant on ridges and dry rocky slopes.

Distinguishing *Thalictrum occidentale* from *T. fendleri* is practically impossible without mature fruits; Hitchcock and Cronquist (1973) should be consulted for these identifications. Generally, mature fruits of *T. occidentale* are reflexed and elliptic. Those of *T. fendleri*, are somewhat erect and obliquely obovate-elliptic to narrowly elliptic. Most *Thalictrum* in the study area appears to be *T. fendleri*, with *T. occidentale* occurring mainly on moist sites north of the latitude of Alpine, Wyo.

Osmorhiza chilensis and *O. depauperata* are also difficult to separate without fruits. In this case, however, the two species often occur on the same site and within the study area their ecologies appear similar enough to be grouped as one. Mature fruits of *O. chilensis* are concavely narrowed toward the tip while those of *O. depauperata* are strongly convex.

Distinguishing *Arnica cordifolia* from *A. latifolia* can be confusing; flowering plants are usually needed for positive identification. The leaves on flowering stems of *A. latifolia* are largest toward the middle and are short-petioled to sessile, whereas those of *A. cordifolia* are largest near the base and are distinctly petiolate. *A. latifolia* is restricted to relatively moist sites; *A. cordifolia* occurs on many dry forest sites.

Physocarpus malvaceus and *P. monogynus* both occur in the study area, but apparently their ranges do not overlap. *P. malvaceus* occurs in the Snake, Bear River, and Yellowstone drainages, while *P. monogynus* occupies only small areas in the Wind River Canyon. These species appear very similar, especially beneath a tree canopy. The key characteristic is that the stigmas of *P. malvaceus* are erect, whereas those of *P. monogynus* diverge strongly along with the tips of the carpels. Along the eastern foothills of the Absaroka Range, some populations of *Physocarpus* appear as intergrades between the two species but were treated herein as *P. malvaceus*.

SYNECOLOGIC PERSPECTIVE AND TERMINOLOGY

The Habitat Type Concept

A habitat type is all the land capable of producing similar plant communities at climax (Daubenmire 1968). Because it is the end result of plant succession, the climax plant community reflects the most meaningful integration of environmental factors affecting vegetation. Each habitat type represents a relatively narrow segment of environmental variation and is delineated by a certain potential for vegetational development. Although one habitat type may support a variety of disturbance-induced or seral plant communities, the ultimate product of vegetational succession anywhere within one habitat type will be similar climax communities. Thus, the habitat type system is a method of site classification that uses the plant community as an indicator of integrated environmental factors as they affect species reproduction and plant community development.

The climax community type provides a logical name for the habitat type, for example *Pseudotsuga menziesii/Calamagrostis rubescens*. The first part of this name is based on the climax tree species, usually the most shade-tolerant tree species adapted to the site. This level of stratification is called the series and encompasses all habitat types having the same dominant tree at climax. The second part of the name is based on the dominant or characteristic species in the undergrowth of the climax community.

Use of climax community types to name habitat types does not imply an abundance of climax vegetation in the present landscape. Actually, most vegetation in the landscape reflects some form of disturbance and represents various stages of succession towards climax. Habitat type names do not imply that we should manage for climax vegetation. In most cases, seral timber species are considered the most productive. Furthermore, this method does not require the presence of a climax stand to identify the habitat type. It can be identified during most stages of succession by comparing the relative reproductive success of the tree species present with known successional trends and by inspecting the existing undergrowth vegetation. During succession, the undergrowth seems to progress toward climax more rapidly than the tree layer and composition of the undergrowth may become relatively stable soon after the coniferous canopy closes. For stands in very early successional stages, the habitat type can often be identified by comparison with adjacent mature stands having similar topographic and edaphic features.

Certain analogies with the systematic taxonomy of plants and the ecology of plant species can help convey ideas on the taxonomic and ecologic nature of habitat types. Habitat types (like plant species) have variable characteristics that complicate identification of individual stands (like individual plants). Closely related habitat types (like closely related species) share many traits and are distinguished by relatively few features. Individual stands within a habitat type (like individual plants within a species) may display some modal characteristics and some traits transitional to other habitat types (other species). "Hybrid stands" (like hybrid plants) are not uncommon, especially along transitions between major climatic regimes, and vegetation or physiographic provinces.

Habitat types (like plant species) have geographic distributions and geographic variation that follow regional patterns of floristics, climate, and topography. As in plant species, one may also talk of endemic and disjunct distributions among habitat types. Widespread habitat types (like widespread plant species) often occupy a variety of site conditions near the center of their distribution, but at their extremes they are generally restricted to more specific substrates and topographic positions. Thus, habitat types vary geographically in the amount of area each one occupies but their relative position along environmental gradients remains the same, even though additions and deletions of habitat types may change the actual sequence.

In developing habitat type classification, potentially important differential species (indicator species) are evaluated in conjunction with stand characteristics, geographic distribution, amplitudes, and zonal sequences of the types. The significance of habitat type indicators is not the species per se but rather their ability to dominate, or survive competition, at climax in a segment of their environment. Therefore, selecting differential species to develop and define the classification system requires consideration of their (1) opportunity to dominate and (2) competitive abilities.

The opportunity for a species to dominate at climax is determined by its relative ecologic amplitude. In order to have this opportunity, a species must have enough amplitude to extend beyond the environmental limits of its superior competitors. Generally, this results in a species becoming the climax dominant on sites where environment is not optimum for the growth of that species. These sites, however, provide the most favorable competitive conditions. In general, a species has the greatest opportunity to become a climax dominant between its own environmental limits and the environmental limits of its superior competitors. Therefore, where climax dominance denotes a relatively small segment of a species total ecologic amplitude, that species holds high potential as a habitat type indicator. On some sites, differential species are selected that do not attain climax dominance. These species have relatively narrow ecologic amplitudes and the ability to survive in the face of competition near certain extremes of their environment. In these plant communities, species having the least relative amplitude tend to have the greatest potential as habitat type indicators.

The competitive ability of forest species to dominate at climax depends on their reproduction methods, growth habit, shade tolerance, and possibly allelopathic resistance or influence. Most coniferous tree species reproduce primarily by seed. If seed production and seedbed conditions are adequate, superior competition is expressed through relative reproductive rates and shade tolerance. Many species in forest undergrowths, and a few coniferous trees, can reproduce vegetatively and thereby achieve an additional competitive advantage. During later successional stages, vegetative reproduction is often a primary factor in maintaining a competitive position. As a result, most species in the forest undergrowth that are selected as habitat type indicators can dominate through vegetative reproduction.

In any classification system, intergrades exist and in the case of habitat types, one must work between extreme concepts of either (1) narrowly defined types with resultant broad ecotones, or (2) broadly defined types with narrow ecotones. One must also choose between a simple system of a few broad types versus numerous narrowly defined types. Our written descriptions of types portray modal conditions and emphasize the central characteristics of the type. On the other hand, the key is written in specific terms that narrow the ecotones for field identification. We have tried to achieve a manageable balance among numbers of classified units, natural variation, and application of the taxonomy to field conditions. Some variation is recognized within all habitat types; where possible, phases are defined to reflect major within-type variation.

Because the relative amounts of types vary from one geographic area to another, one must exercise judgment when identifying ecotones. For instance, a type may occupy a broad area between two other types in one geographic area, but may be recognizable only as a narrow ecotonal situation in other geographic areas. Scale of mapping and type of management action will influence how these transitional areas are interpreted and displayed. Transitional areas (ecotones) and "hybrid stands" may complicate matters, but can still be mapped as intergrades, referenced to adjacent types, and managed accordingly.

In discussing the relationship of a habitat type to certain environmental features, we have followed the general polyclimax concept of Tansley (1935). Thus, a **climatic climax** is found on deep loamy soils of gently undulating relief; an **edaphic climax** develops on the other soils and types of relief; and a **topographic climax** reflects compensating effects of aspect, or different microclimatic effect. The **topoedaphic climax** is a convenient way to designate deviation from a climatic climax due to combined effects of **edaphic** and **topographic** features. Some habitat types are exclusively one type of climax, but most can be found in any category, depending on the interaction of specific environmental features. In steep mountainous terrain, climatic climax sites are generally scarce. Most stands observed are influenced strongly by topographic features such as aspect and slope or by edaphic features such as loess or volcanic ash deposits.

The habitat type classification is useful to forest management in several ways. It provides a permanent and ecologically based system of land stratification in terms of vegetational potential (Daubenmire 1976). It also provides a classification system for near climax forest communities. Each habitat type encompasses a certain amount of environmental variation, but the variation within a particular habitat type is generally less than between types. Thus, successional trends should be predictable for each habitat type and responses to management treatments should be similar on most lands within the same type or phase.

Habitat Type Versus Continuum Philosophy

For many years, ecologists who studied plant communities debated the interpretation of plant community organization. Although several philosophies developed, debate often centered on two of them: (1) advocates of typal communities argued that distinct vegetational types develop at climax and reappear across the landscape wherever environmental conditions are similar (Daubenmire 1966); (2) continuum advocates argued that even at climax, vegetation, like environment, varies continuously over the landscape (Cottam and McIntosh 1966; Vogl 1966). Some who advocated the typal communities philosophy related habitat type classifications to the relatively "clear cut" taxonomic classification of the plant kingdom. Some continuum advocates regarded habitat type classifications as an attempt to categorize arbitrary intervals along a complex vegetational continuum. Interest in this debate is now declining as shown by Collier and others (1973), who present these contrasting philosophies and advocate an intermediate viewpoint.

Although this debate may still be of some academic interest, it need not preoccupy natural resource managers and field biologists who need a logical, ecologically based environmental classification with which to work. We acknowledge that continua may exist in the landscape; nevertheless, our objective is to develop a logical site classification based on the natural patterns of potential climax vegetation. Local conditions that deviate from this classification can still be described in terms of how they differ from the typal descriptions presented herein.

THE PHYSICAL SETTING

Physiography And Geology

The study area includes portions of five physiographic provinces (Fenneman 1931) and encompasses a multitude of land forms generated by many different geomorphic processes. The great majority of the area lies within the Middle Rocky Mountain Province, which includes three geologically distinct groups of mountain ranges.

The western mountain group, known collectively as the Wyommide Ranges, includes the Gros Ventre, Snake River, Big Hole, Hoback, Salt River, Wyoming, and Teton Ranges; all are characterized by conspicuous thrust faulting and according to Fenneman (1931) would be considered part of the Basin and Range Province were it not for the intervening expanse of the Snake River Plain.

Running north-south along the eastern margin of the study area, the Absaroka Range, Washakie Mountains, and the westernmost projection of the Owl Creek Range represent eroded extrusive volcanic rock, composed chiefly of basic andesitic breccia and basalt (Thornbury 1965). Immediately to the west of the Absaroka Range, flows of acidic extrusive rock, rhyolite and rhyolitic tuff, blanket the plateaus of Yellowstone National Park. Relatively infertile coarse alluvium from these plateaus has been deposited in the West Yellowstone Basin.

The third and easternmost group, the Wind River and eastern portion of the Owl Creek Range, was generated by domal uplifts with cores of acidic intrusive igneous (granitics) or metamorphic rocks.

The west slope of the Absaroka Range, perhaps the most extensively forested upland in the study area, is blanketed by stands composed mainly of *Pinus contorta*, *Pseudotsuga menziesii*, *Picea engelmannii*, and *Abies lasiocarpa*; *Pinus albicaulis* stands are extensive at the highest forested elevations. In contrast, the Yellowstone Plateau area is forested with uniform expanses of *Pinus contorta* (with scattered to dense *P. albicaulis*) and occasional stands of *Abies* and *Picea*, usually on sites protected from fire. Similar expansive and persistent *P. contorta* stands on acidic rocks have been described for the West Yellowstone Basin in Montana (Cooper 1975; Pfister and others 1977), the Bighorn Mountains (Despain 1973), and Wind River Range (Reed 1976) in Wyoming, and the Front Range in Colorado (Moir 1969).

To the south, the fault block Teton Range, rising to numerous 3 660 m (12,000 feet) peaks, exposes on its east face the largest expanse of intrusive igneous rocks in the study area, exclusive of the Wind River Range. The less steep western slope is composed primarily of sedimentaries; both slopes appear equally and densely forested by seral stands of *Pseudotsuga* and *Pinus contorta*. Areas free of fire for several hundred years support near climax stands of *Abies lasiocarpa* and *Picea*. Orographically stimulated precipitation in the vicinity of the Tetons may be the highest of any location within the study area. A continued high precipitation since Pleistocene may explain why the Tetons vicinity has served as a refugium for such disjunct species as *Xerophyllum tenax*, *Ledum glandulosum, Menziesia ferruginia*, and *Luzula hitchcockii* which are more typical of the Northern Rocky Mountains, where a maritime influence extends far inland.

Down-faulted Jackson Hole is mantled for most of its length on the western edge with glacial till of several origins; most of the till is forested with *Pinus contorta* and *Populus tremuloides*. The associated glacial outwash plains support primarily shrub-steppe (*Artemisia* spp. and *Purshia tridentata* dominated) communities (Oswald 1966; Sabinski and Knight 1978).

The extensive Gros Ventre and Hoback Ranges (to 3 350 m, 11,000 feet) are less dissected and not as high as the Teton Range and are less forested, with lower slope stands more strongly confined to northern aspects. To the south and east, in the Wind River, Owl Creek, and southern Absaroka Ranges, the landscape appears much drier, and the lower tree-line is elevated by some 150 to 300 m (500 to 1,000 feet). The forests of these ranges relate strongly to parent material. Expansive *Pinus contorta* forests occupy the central granodiorite core of the Wind River Range; some of these stands appear to be climax (Reed 1976). The eastern slope of the Wind River Range, exhibiting one of the most extensive calcareous substrates within the study area, is strongly dominated by *Pseudotsuga* and *Picea* habitat types; *P. contorta* is notably absent. Earle Layser (consultant, Pers. Comm.) has also noted certain forest relationships to limestone in the Gros Ventre Mountains. Very similar patterns of tree response to substrate have been reported by Despain (1973) for the Bighorn Mountains in Wyoming and by Goldin and Nimlos (1977) for the Garnet Mountains in Montana.

The sediment-filled Island Park Basin also supports extensive stands of *Pinus contorta* but their mesic undergrowths suggest that *P. contorta* is largely seral. This basin is bordered on the north by the Centennial Range, which is an oddity in its east-west orientation, and is part of the Northern Rocky Mountain Province. The Centennials support *Pseudotsuga* and *Abies* habitat types on volcanic and sedimentary substrates. At its eastern end, the Centennial Range is joined by a southward trending geosyncline of the Madison Range (Thornbury 1965). In this portion of the Madison Range parent materials are diverse and convoluted. The western face of this range supports rather dry habitat types; *Populus tremuloides* is well represented as both a seral and perhaps a climax species. Its abundance tends to increase from the southern arm of the Madison Range eastward to the Yellowstone Plateau and southward to the Bear River Range on the Utah border.

From the Teton, Gros Ventre, and Hoback Ranges to the Bear River Range are a complex of mountains characterized by extensive overthrust faulting which has convoluted their sedimentary origin. Here few summits exceed 2 740 m (9,000 feet) except for sections of the Wyoming and Salt River Ranges. The *Pseudotsuga* and *Abies* series are well developed on these sedimentaries. Minor ranges west of the Bear River Range lie in the Basin and Range and Columbia Plateau provinces and protrude above a layer of late tertiary basaltic lavas mantled with Pleistocene alluvium. Some of these mountains are volcanic erosional remnants while others, such as the Albion Range contain uplifted sedimentaries. These mountains are only partially forested by the *Abies* and *Pseudotsuga* series.

Climate

Baker (1944) has presented climatic descriptions for the mountainous areas of the West. Although the study area encounters six of his climatic regions, the bulk of the area lies within his western Wyoming and central Wyoming designations (other regions include southwestern Montana, central Idaho, Utah, and basin and range regions). Baker (1944) states that the precipitation regime in western Wyoming is more evenly distributed month to month than in any other part of the West. To the east in the central Wyoming region, precipitation is markedly less, with a notable peak in May typical of a continental regime. Weather data (appendix D-2) from the West Yellowstone, Snake River, and Moose stations in western Wyoming versus stations to the east such as Pinedale, Dubois, Louis Lake, and most notably Willow Park in the Bighorn Range, demonstrate these contrasting regimes. Baker (1944) stated that these two different precipitation regimes were separated by the crest of the Wind River Range. More recent records than were available to Baker, including storage gage stations, indicate that the continental regime encompasses the entire Wind River Range rather than just the eastern half.

The continental effect is also evident across the northern lower elevations of Yellowstone Park. To the west and south and at upper elevations to the east, however, this effect is progressively reduced by the overriding Pacific maritime influence. The transition from low total precipitation of the central Wyoming regime to higher totals of the western Wyoming regime occurs roughly along a line slightly east of the crest of the Absaroka Range from about Cooke City, Mont., to Togwotee Pass and south to Bondurant, Wyo. Some indicator species with high coverages to the west rarely appear east of this line in the study area, for example, *Calamagrostis rubescens, Carex geyeri, Symphoricarpos albus, Spiraea betulifolia, Vaccinium globulare, Lonicera utahensis, Linnaea borealis, Sorbus scopulina, Goodyera oblongifolia*, and *Galium triflorum*.

South of Bondurant, records of the Border, Wyo., station (fig. 2) and other stations west of the Salt River Mountains show a precipitation pattern similar to that of the Jackson Hole area. A lack of sufficient stations east of the Salt River Range precludes any conclusions as to precipitation patterns in this area. Nevertheless, records of nearby stations (Border and Pinedale, Wyo.), and vegetational patterns indicate a transition from a relatively moist climate in the west to a dry continental climate in the east.

Though Baker (1944) recognized a southwestern Montana region, which includes northern Yellowstone Park, examination of his precipitation and temperature data indicates that the climate is quite similar to the central Wyoming regime; Baker's separation of the two regimes was probably based on differences that would be expected when two areas are separated by a large mountain mass such as the northern Absaroka and Beartooth Ranges. Vegetational patterns of the two areas are similar and reflect a continental climate.

The extreme northwestern portion of the study area lies within the eastern half of Baker's (1944) central Idaho region. Although precipitation patterns from weather stations in that area (Spencer Ranger Station and Kilgore) correspond to that of Baker, they do not correspond to the typical pattern of eastern central Idaho, which reflects a much stronger continental climate than Baker's (1944) pattern of central Idaho suggests. In fact, precipitation and vegetational patterns of the Spencer R.S.-Kilgore forested area relate more closely to immediate areas of the western Wyoming regime than the actual central Idaho regime (eastern half).

The southwestern portion of the study area lies mainly within Baker's (1944) basin and range regime and includes a small projection of his Utah region. Although no stations have been maintained in the mountains, nearby valley stations, Oakley and Malta, indicate that May and June are the wettest months and only a slight moisture peak occurs in the winter months. This pattern probably typifies the northern basin and range region although Baker gives no data for comparison.

Several classic climatic effects are represented by stations within the study area. Island Park Dam, at 1 920 m (6,300 feet) in elevation, reports more total precipitation than Lake Yellowstone, which lies 488 m (1,600 feet) higher on the Yellowstone Plateau to the east. The higher precipitation at Island Park Dam reflects the "approach effect" generated by air masses being forced upward as they encounter the first mountainous area after traversing the Snake River Plains. The southwestern corner of Yellowstone Park is generally considered to have the greatest snow accumulation in the Park and data from the weather station closest to this area, Snake River R. S., supports this observation. This portion of the Park, like the Snake, Big Hole, and Caribou Ranges are the first large mountains to intercept storm systems traversing the Snake River Plains. Consequently, these mountains support some relatively moist upland habitat types.

West Yellowstone at 2 030 m (6,667 feet) is a colder station than would be expected at that elevation. This station lies in a large basin that impounds the cold air flowing off surrounding uplands. This "frost pocket effect" combined with sandy alluvial substrates results in a distinct *Pinus contorta/Purshia tridentata* association (Pfister and others 1977).

The Valley 6W station lies east of the Continental Divide in the Absaroka Range and registers the greatest precipitation of any station in the study area. This precipitation may be augmented by the "canyon effect," which collects precipitation generated by adjacent mountain ridges. Valley 6W, a moist subalpine station, may be contrasted with the dry subalpine climate of the St. Lawrence and Mosquitoe Park Stations in the Wind River Range. The Wind River Range, with its conspicuously low amounts of winter precipitation, may represent the "rain-shadow effect" created by high mountain ranges to the west and north as well as a moderate continental regime.

SUCCESSIONAL STATUS OF EASTERN IDAHO-WESTERN WYOMING FORESTS

Fire History

Data and observations from the study area support the general conclusion of Wellner (1970) that fire has burned over most all forest land in the northern Rocky Mountains at one time or another. In northwestern Wyoming, these were mostly small fires that crept sporadically through the forest, consuming litter and tree seedlings but seldom killing the larger trees (Loope and Gruell 1973). Prior to fire suppression, this type of fire probably occurred about every 20-25 years in northern Yellowstone Park (Houston 1973) and about every 50-100 years in the Jackson Hole area (Loope and Gruell 1973). To the south and east of these areas it appears that fire frequency may have been even less.

Immediately after burning, stands are relatively fire resistant, but as plant succession advances, the susceptibility to large, devastating fires increases. The infrequent combination of heavy, high fuel loads, extremely dry conditions, several ignition sources, and high winds produced conflagrations in the Jackson Hole area in the 1840's, 1870's and 1880's (Loope and Gruell 1973). Houston (1973) estimates that 8 to 10 large, widespread fires have occurred in northern Yellowstone Park in the past 300-400 years.

In recent years, organized fire suppression has substantially reduced fire frequency and has allowed plant succession to achieve fuel conditions more prone to intense wildfire. These fuel buildups tend to occur more rapidly in the more productive habitat types (appendix E-2). Many of the less productive types such as in the *Pinus flexilis* and *P. albicaulis* series can still support only creeping groundfires even after several hundred years of uninterrupted succession. Gruell (1980) illustrates various forest successions and the consequent fuel buildups in part of the study area.

Grazing History

Early, unregulated cattle grazing and later sheep grazing have substantially affected portions of the study area. Cattle originally depleted much of the available forage near lower elevations of the forested zone. In general, these effects increased from north to south. In the north, range depletion was estimated at 0 to 25 percent of virgin condition while some areas in the south were estimated at more than 75 percent (McArdle and others 1936). Local exceptions occur in the vicinity of livestock driveways, pioneer travel routes, and early settlements. In all areas, the most serious depletion was on private and public do-main lands, but wherever the forest becomes interrupted by meadows and sage-grass communities, it is more vulnerable to livestock damage. The animals use much of the forest that borders rangeland for bedding and shelter and severely trample forest undergrowths. Consequently, old growth stands in these areas rarely have undergrowth development indicative of stand age.

By the turn of the century, the early cattle boom had ended, but as cattle numbers began adjusting to range capacity, sheep numbers increased dramatically. By 1903, Idaho had 2.6 million sheep and by 1909, Wyoming had 6 million (Stewart 1936). Ideal summer range in the study area no doubt attracted a large percentage of these animals at least part of the year. Because there were no grazing allotments, various sheep herds competed for the forage by racing to summer ranges, using as much forage as possible, and leaving the site unfit for other herds (Stewart 1936). Consequently, range depletion by sheep occurred from lower elevations to ridges and mountain meadows at upper elevations.

Today, smaller bands of sheep still graze the upper ridges and meadows in much of the study area and cattle graze in parts of the mid- and lower elevation forests. Although the widespread grazing abuse of the early 1900's has ended, localized abuse still occurs wherever animals congregate.

As with cattle, the adverse effects of sheep in the study area increase from north to south. Although some fragile, high elevation sites along the Montana border are still heavily grazed, the most serious depletion exists near the Utah border. Here, some forested areas contain very few undergrowth species and the adjacent openings contain mostly bare soil or *Rudbeckia*, and other species indicative of severe disturbance.

In most river valleys of the study area, reduction of forage by livestock, agriculture, and settlements conflicts with winter forage demands of big game animals. In some areas, this in turn causes severe big game use of adjacent forests. Most notable is in the valleys of the upper Snake River drainage system, where big game animals are fed hay and alfalfa pellets in winter to alleviate the conflicts created by man and his animals. Here, some coniferous forest communities have been severely altered by wintering big game and some aspen communities have been decimated by a combination of big game, insects, and disease (Krebill 1972). On some big game wintering grounds, livestock use has been curtailed on the Federal lands to help reduce this conflict.

Logging History

Early logging activities concentrated in the lower elevation forests most accessible from towns, homesteads, mining developments, and major rivers. Usually only high quality timber was taken and the stands were left in a degraded condition. In some areas, railroad construction created an early demand for timber. The demand for railroad ties centered on *Pseudotsuga* and *Pinus contorta* of sizes which could be easily hacked into ties. Such "tie-hack" operations again focused on low-elevation forests, often a considerable distance from any settlement. Tie cutters would eliminate certain size classes of timber and leave behind the large, unwieldy and the small, unprofitable trees. Effects of early "tie hacking" are still visible in certain stands.

Early commercial lumbering also concentrated on the most accessible forests but gradually gained access to more remote stands of valuable timber. Now, access to uncut stands is sought continually but in some places the combination of steep terrain and low quality timber has deterred commercial interests. In other areas, large-scale timber harvesting continues and examples of certain undisturbed forest communities will soon be very rare. Two national parks and several wilderness areas have preserved many representative plant communities. Most of these preserved communities, however, represent only the higher elevations and are concentrated in the northeastern quarter of the study area. Examples of old-growth forest in the remainder of the study area are rapidly disappearing.

THE HABITAT TYPE CLASSIFICATION

Some 50 forest habitat types have been defined within the study area. This seemingly large number reflects the environmental diversity encountered. The total classification is listed in table 1 for easy reference and includes eight incidental habitat types. The term "habitat type" is mentioned so often that the abbreviation "h.t." ("h.t.'s" plural) is used to save space. Frequent use of h.t. names in the text also create a need for abbreviations. We have used the first two letters of the genus and the first two letters of the species of the two plants involved as the taxonomic abbreviation of each h.t. Scientific names of h.t.'s and their abbreviations are listed in table 1. Scientific, abbreviated, and common names of indicator species are listed in the h.t. field form (appendix F). Common names are not used in the text because variation in their local usage may cause confusion. Initially, these abbreviations may seem strange, but professional foresters and biologists are accepting them as a convenient substitute for common names.

The classification is presented in the following order:

1. Key to the habitat types.— The first step in correct identification of the habitat type is becoming familiar with the instructions for use of the key. Next comes identification of the potential climax series, followed by identification of the habitat type and then the phase.

2. Series description.—Many habitat type characteristics are summarized at the series level, rather than repeating general similarities in vegetation and habitat characteristics for each habitat type description.

3. Habitat type description.—This information summarizes geographic range, vegetation, phases, and general management implications.

Table 1.—Eastern Idaho-western Wyoming forest habitat types and phases and assigned ADP codes

ADP Code[1]	Abbreviation	Habitat Types and Phases — Scientific name	Habitat Types and Phases — Common name
000		***PINUS FLEXILIS*** **SERIES**	
080	PIFL/HEKI h.t.	*Pinus flexilis/Hesperochloa kingii* h.t.	limber pine/spike fescue
050	PIFL/FEID h.t.	*Pinus flexilis/Festuca idahoensis* h.t.	limber pine/Idaho fescue
051	-FEID phase	*-Festuca idahoensis* phase	-Idaho fescue phase
060	PIFL/CELE h.t.	*Pinus flexilis/Cercocarpus ledifolius* h.t.	limber pine/curl-leaf mountain-mahogany
070	PIFL/JUCO h.t.	*Pinus flexilis/Juniperus communis* h.t.	limber pine/common juniper
200		***PSEUDOTSUGA MENZIESII*** **SERIES**	
220	PSME/FEID h.t.	*Pseudotsuga menziesii/Festuca idahoensis* h.t.[2]	Douglas-fir/Idaho fescue
221	-FEID phase	*-Festuca idahoensis* phase[2]	-Idaho fescue phase
380	PSME/SYOR h.t.	*Pseudotsuga menziesii/Symphoricarpos oreophilus* h.t.	Douglas-fir/mountain snowberry
370	PSME/ARCO h.t.	*Pseudotsuga menziesii/Arnica cordifolia* h.t.	Douglas-fir/heartleaf arnica
371	-ARCO phase	*-Arnica cordifolia* phase	-heartleaf arnica phase
372	-ASMI phase	*-Astragalus miser* phase	-weedy milkvetch phase
385	PSME/CELE h.t.	*Pseudotsuga menziesii/Cercocarpus ledifolius* h.t.	Douglas-fir/curl-leaf mountain-mahogany
360	PSME/JUCO h.t.	*Pseudotsuga menziesii/Juniperus communis* h.t.	Douglas-fir/common juniper
395	PSME/BERE h.t.	*Pseudotsuga menziesii/Berberis repens* h.t.	Douglas-fir/Oregon grape
397	-SYOR phase	*-Symphoricarpos oreophilus* phase	-mountain snowberry phase
399	-JUCO phase	*-Juniperus communis* phase	-common juniper phase
398	-CAGE phase	*-Carex geyeri* phase[2]	-elk sedge phase
396	-BERE phase	*-Berberis repens* phase	-Oregon grape phase
320	PSME/CARU h.t.	*Pseudotsuga menziesii/Calamagrostis rubescens* h.t.	Douglas-fir/pinegrass
325	-PAMY phase	*-Pachistima myrsinites* phase	-pachistima phase
323	-CARU phase	*-Calamagrostis rubescens* phase	-pinegrass phase
340	PSME/SPBE h.t.	*Pseudotsuga menziesii/Spiraea betulifolia* h.t.	Douglas-fir/white spirea
343	-CARU phase	*-Calamagrostis rubescens* phase	-pinegrass phase
341	-SPBE phase	*-Spiraea betulifolia* phase	-white spirea phase
375	PSME/OSCH h.t.	*Pseudotsuga menziesii/Osmorhiza chilensis* h.t.	Douglas-fir/mountain sweetroot
310	PSME/SYAL h.t.	*Pseudotsuga menziesii/Symphoricarpos albus* h.t.	Douglas-fir/common snowberry
313	-SYAL phase	*-Symphoricarpos albus* phase	-common snowberry phase
270	PSME/PHMO h.t.	*Pseudotsuga menziesii/Physocarpus monogynus* h.t.[2]	Douglas-fir/mountain ninebark
280	PSME/VAGL h.t.	*Pseudotsuga menziesii/Vaccinium globulare* h.t.	Douglas-fir/blue huckleberry
281	-VAGL phase	*-Vaccinium globulare* phase	-blue huckleberry phase
390	PSME/ACGL h.t.	*Pseudotsuga menziesii/Acer glabrum* h.t.	Douglas-fir/mountain maple
391	-PAMY phase	*-Pachistima myrsinites* phase	-pachistima phase
260	PSME/PHMA h.t.	*Pseudotsuga menziesii/Physocarpus malvaceus* h.t.	Douglas-fir/ninebark
266	-PAMY phase	*-Pachistima myrsinites* phase	-pachistima phase
265	-PSME phase	*-Pseudotsuga menziesii* phase	-Douglas-fir phase
400		***PICEA ENGELMANNII*** **SERIES**	
493	PIEN/HYRE h.t.	*Picea engelmannii/Hypnum revolutum* h.t.	spruce/hypnum
495	PIEN/ARCO h.t.	*Picea engelmannii/Arnica cordifolia* h.t.	spruce/heartleaf arnica
497	PIEN/RIMO h.t.	*Picea engelmannii/Ribes montigenum* h.t.	spruce/mountain gooseberry
475	PIEN/JUCO h.t.	*Picea engelmannii/Juniperus communis* h.t.	spruce/common juniper
485	PIEN/VASC h.t.	*Picea engelmannii/Vaccinium scoparium* h.t.	spruce/grouse whortleberry
470	PIEN/LIBO h.t.	*Picea engelmannii/Linnaea borealis* h.t.	spruce/twinflower
440	PIEN/GATR h.t.	*Picea engelmannii/Galium triflorum* h.t.	spruce/sweet-scented bedstraw
430	PIEN/PHMA h.t.	*Picea engelmannii/Physocarpus malvaceus* h.t.[2]	spruce/ninebark
490	PIEN/CADI h.t.	*Picea engelmannii/Carex disperma* h.t.	spruce/soft leaved sedge
415	PIEN/CALE h.t.	*Picea engelmannii/Caltha leptosepala* h.t.	spruce/elkslip marsh marigold
410	PIEN/EQAR h.t.	*Picea engelmannii/Equisetum arvensis* h.t.	spruce/common horsetail
600		***ABIES LASIOCARPA*** **SERIES**	
650	ABLA/CACA h.t.	*Abies lasiocarpa/Calamagrostis canadensis* h.t.	subalpine fir/bluejoint
655	-LEGL phase	*-Ledum glandulosum* phase[2]	-Labrador tea phase
654	-VACA phase	*-Vaccinium caespitosum* phase[2]	-dwarf huckleberry phase
651	-CACA phase	*-Calamagrostis canadensis* phase	-bluejoint phase
635	ABLA/STAM h.t.	*Abies lasiocarpa/Streptopus amplexifolius* h.t.[2]	subalpine fir/twisted stalk
636	-STAM phase	*-Streptopus amplexifolius* phase[2]	-twisted stalk phase
670	ABLA/MEFE h.t.	*Abies lasiocarpa/Menziesia ferruginea* h.t.[2]	subalpine fir/menziesia
671	-MEFE phase	*-Menziesia ferruginea* phase[2]	-menziesia phase
601	ABLA/ACRU h.t.	*Abies lasiocarpa/Actaea rubra* h.t.	subalpine fir/baneberry
603	ABLA/PHMA h.t.	*Abies lasiocarpa/Physocarpus malvaceus* h.t.	subalpine fir/ninebark
645	ABLA/ACGL h.t.	*Abies lasiocarpa/Acer glabrum* h.t.	subalpine fir/mountain maple
647	-PAMY phase	*-Pachistima myrsinites* phase	-pachistima phase
660	ABLA/LIBO h.t.	*Abies lasiocarpa/Linnaea borealis* h.t.	subalpine fir/twinflower
663	-VASC phase	*-Vaccinium scoparium* phase	-grouse whortleberry phase
661	-LIBO phase	*-Linnaea borealis* phase	-twinflower phase
690	ABLA/XETE h.t.	*Abies lasiocarpa/Xerophyllum tenax* h.t.[2]	subalpine fir/beargrass
691	-VAGL phase	*-Vaccinium globulare* phase[2]	-blue huckleberry phase
692	-VASC phase	*-Vaccinium scoparium* phase[2]	-grouse whortleberry phase

(con)

Table 1.—(con)

ADP Code[1]	Abbreviation	Habitat Types and Phases: Scientific name	Common name
720	ABLA/VAGL h.t.	*Abies lasiocarpa/Vaccinium globulare* h.t.	subalpine fir/blue huckleberry
721	-VASC phase	-*Vaccinium scoparium* phase	-grouse whortleberry phase
722	-PAMY phase	-*Pachistima myrsinites* phase	-pachistima phase
723	-VAGL phase	-*Vaccinium globulare* phase	-blue huckleberry phase
830	ABLA/LUHI h.t.	*Abies lasiocarpa/Luzula hitchcockii* h.t.[2]	subalpine fir/smooth woodrush
831	-VASC phase	-*Vaccinium scoparium* phase[2]	-grouse whortleberry phase
730	ABLA/VASC h.t.	*Abies lasiocarpa/Vaccinium scoparium* h.t.	subalpine fir/grouse whortleberry
731	-CARU phase	-*Calamagrostis rubescens* phase	-pinegrass phase
734	-PIAL phase	-*Pinus albicaulis* phase	-whitebark pine phase
732	-VASC phase	-*Vaccinium scoparium* phase	-grouse whortleberry phase
701	ABLA/ARLA h.t.	*Abies lasiocarpa/Arnica latifolia* h.t.	subalpine fir/mountain arnica
607	ABLA/SYAL h.t.	*Abies lasiocarpa/Symphoricarpos albus* h.t.	subalpine fir/common snowberry
609	ABLA/THOC h.t.	*Abies lasiocarpa/Thalictrum occidentale* h.t.	subalpine fir/western meadowrue
760	ABLA/OSCH h.t.	*Abies lasiocarpa/Osmorhiza chilensis* h.t.	subalpine fir/mountain sweetroot
761	-PAMY phase	-*Pachistima myrsinites* phase	-pachistima phase
762	-OSCH phase	-*Osmorhiza chilensis* phase	-mountain sweetroot phase
705	ABLA/SPBE h.t.	*Abies lasiocarpa/Spiraea betulifolia* h.t.	subalpine fir/white spirea
750	ABLA/CARU h.t.	*Abies lasiocarpa/Calamagrostis rubescens* h.t.	subalpine fir/pinegrass
752	-PAMY phase	-*Pachistima myrsinites* phase	-pachistima phase
751	-CARU phase	-*Calamagrostis rubescens* phase	-pinegrass phase
703	ABLA/BERE h.t.	*Abies lasiocarpa/Berberis repens* h.t.	subalpine fir/Oregon grape
704	-CAGE phase	-*Carex geyeri* phase[2]	-elk sedge phase
702	-BERE phase	-*Berberis repens* phase	-Oregon grape phase
790	ABLA/CAGE h.t.	*Abies lasiocarpa/Carex geyeri* h.t.[2]	subalpine fir/elk sedge
791	-CAGE phase	-*Carex geyeri* phase[2]	-elk sedge phase
745	ABLA/JUCO h.t.	*Abies lasiocarpa/Juniperus communis* h.t.	subalpine fir/common juniper
810	ABLA/RIMO h.t.	*Abies lasiocarpa/Ribes montigenum* h.t.	subalpine fir/mountain gooseberry
812	-PIAL phase	-*Pinus albicaulis* phase	-whitebark pine phase
811	-RIMO phase	-*Ribes montigenum* phase	-mountain gooseberry phase
707	ABLA/PERA h.t.	*Abies lasiocarpa/Pedicularis racemosa* h.t.	subalpine fir/pedicularis
780	ABLA/ARCO h.t.	*Abies lasiocarpa/Arnica cordifolia* h.t.	subalpine fir/heartleaf arnica
784	-PIEN phase	-*Picea engelmannii* phase	-Engelmann spruce phase
783	-SHCA phase	-*Shepherdia canadensis* phase	-russett buffalo-berry phase
782	-ASMI phase	-*Astragalus miser* phase	-weedy milkvetch phase
781	-ARCO phase	-*Arnica cordifolia* phase	-heartleaf arnica phase
795	ABLA/CARO h.t.	*Abies lasiocarpa/Carex rossii* h.t.	subalpine fir/Ross sedge
870		***PINUS ALBICAULIS* SERIES**	
875	PIAL/VASC h.t.	*Pinus albicaulis/Vaccinium scoparium* h.t.	whitebark pine/grouse whortleberry
880	PIAL/CAGE h.t.	*Pinus albicaulis/Carex geyeri* h.t.	whitebark pine/elk sedge
885	PIAL/JUCO h.t.	*Pinus albicaulis/Juniperus communis* h.t.	whitebark pine/common juniper
886	-SHCA phase	-*Shepherdia canadensis* phase	-russett buffalo-berry phase
887	-JUCO phase	-*Juniperus communis* phase	-common juniper phase
895	PIAL/CARO h.t.	*Pinus albicaulis/Carex rossii* h.t.	whitebark pine/Ross sedge
896	-PICO phase	-*Pinus contorta* phase	-lodgepole pine phase
897	-CARO phase	-*Carex rossii* phase	-Ross sedge phase
891	PIAL/FEID h.t.	*Pinus albicaulis/Festuca idahoensis* h.t.	whitebark pine/Idaho fescue
900		***PINUS CONTORTA* SERIES**	
930	PICO/LIBO c.t.	*Pinus contorta/Linnaea borealis* c.t.[2]	lodgepole pine/twinflower
935	PICO/VAGL c.t.	*Pinus contorta/Vaccinium globulare* c.t.[2]	lodgepole pine/blue huckleberry
940	PICO/VASC c.t.	*Pinus contorta/Vaccinium scoparium* c.t.[2]	lodgepole pine/grouse whortleberry
945	PICO/SPBE c.t.	*Pinus contorta/Spiraea betulifolia* c.t.[2]	lodgepole pine/white spirea
950	PICO/CARU c.t.	*Pinus contorta/Calamagrostis rubescens* c.t.[2]	lodgepole pine/pinegrass
955	PICO/CAGE c.t.	*Pinus contorta/Carex geyeri* c.t.[2]	lodgepole pine/elk sedge
960	PICO/JUCO c.t.	*Pinus contorta/Juniperus communis* c.t.[2]	lodgepole pine/common juniper
975	PICO/SHCA c.t.	*Pinus contorta/Shepherdia canadensis* c.t.[2]	lodgepole pine/russett buffalo-berry
965	PICO/ARCO c.t.	*Pinus contorta/Arnica cordifolia* c.t.[2]	lodgepole pine/heartleaf arnica
970	PICO/CARO c.t.	*Pinus contorta/Carex rossii* c.t.[2]	lodgepole pine/Ross sedge
990		***POPULUS TREMULOIDES* SERIES**	

Total number of habitat types = 58[3]
Total number of habitat types and additional phases = 82[4]
Total number of *Pinus contorta* community types = 10

[1]Automatic data processing codes.
[2]Incidental habitat types or phases, or *Pinus contorta* community types omitted from other charts and tables.
[3]Eight of these are incidental to the study area.
[4]Five of the additional phases are incidental to the study area.

Arrangement of habitat types within the keys tends to progress from the wet-moderate (least stressful) to more severe environments. At the lower elevations, progression through the keys leads to increasingly drier types and at upper elevations it leads to increasingly colder types. Occasionally, this order deviates when habitat types from different geographic areas are merged into one key. Once familiar with the key, awareness of this sequence can help the user identify sites that are difficult to key out. The h.t. descriptions are arranged in the order they appear in the key.

Distributions of h.t.'s are illustrated with dot maps and summarized in the first paragraph of each h.t. description.

The arrows on some maps indicate occurrence of that h.t. beyond the study area. The density of dots on some maps is a function of sampling intensity and does not always indicate relative abundance of the h.t. Relative abundance of a type is indicated by the terms: incidental, minor, or major. An incidental h.t. or phase rarely occurs in the study area (hence, no dot map) but was included in the key in case it is encountered. A minor h.t. seldom occupies large acreages but may be common in the study area and of major importance to land management. A major h.t. occupies extensive acreages in at least some portion of the study area.

KEY TO SERIES, HABITAT TYPES, AND PHASES.

READ THESE INSTRUCTIONS FIRST!

1. Use this key for stands with a mature tree canopy that are not severely disturbed by grazing, logging, forest fire, etc. (If the stand is severely disturbed or in an early successional stage, the habitat type can best be determined by extrapolating from the nearest mature stand occupying a similar site.)

2. Accurately identify and record canopy coverages for all indicator species (appendix F).

3. Check plot data in the field to verify that the plot is representative of the stand as a whole. If not, take another plot.

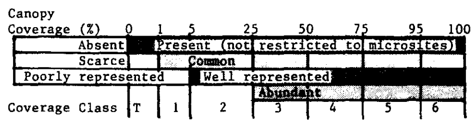
4. Identify the correct potential climax tree species in the SERIES key. (Generally, a tree species is considered reproducing successfully if 10 or more individuals per acre occupy or will occupy the site.)

5. Within the appropriate series, key to HABITAT TYPE and PHASE by following the key literally. Verify your identification by comparing the stand conditions with the written descriptions. (The first phase in the key that fits the stand is the correct one.)

6. Use the definitions diagramed below for canopy coverage terms in the key. If you have difficulty deciding between types, refer to constancy and coverage data (appendix C-1) and the habitat type descriptions.

7. In stands where undergrowth is obviously depauperate (unusually sparse) because of dense shading or duff accumulations, adjust the definitions diagramed below to the next lower coverage class (for example, well represented >1%, common >0%.

8. Remember, the key is NOT the classification! Validate the determination made using the key by checking the written description and appendix C-1.



KEY TO CLIMAX SERIES
(Do Not Proceed Until You Have Read The Instructions)

1. Abies lasiocarpa present and reproducing successfully . . . . ABIES LASIOCARPA SERIES (item F)
1. A. lasiocarpa not the indicated climax 2

2. Picea engelmannii present and reproducing successfully . . . . PICEA ENGELMANNII SERIES (item D)
2. P. engelmannii not the indicated climax 3

3. Pinus flexilis a successfully reproducing dominant in old growth stands; often sharing that status with Pseudotsuga . . . . PINUS FLEXILIS SERIES (item B)
3. P. flexilis absent or clearly seral 4

4. Pseudotsuga menziesii present and reproducing successfully . . . . PSEUDOTSUGA MENZIESII SERIES (item C)
4. P. menziesii not the indicated climax dominant 5

5. Pinus albicaulis present and reproducing successfully . . . . PINUS ALBICAULIS SERIES (item E)
5. P. albicaulis not the indicated successional dominant 6

6. Pinus contorta dominant and reproducing successfully . . . . PINUS CONTORTA SERIES (item A)
6. P. contorta not the indicated successional dominant 7

7. Populus tremuloides the indicated dominant . . . . POPULUS TREMULOIDES SERIES (p.74)
7. P. tremuloides not the indicated dominant. Juniperus osteosperma or Acer grandidentatum dominating the site . . . . Minor forest types (p.75)

A. Key to Pinus contorta Community Types

1. Linnaea borealis common . . . . PINUS CONTORTA/LINNAEA BOREALIS c.t.* (p.72)
1. L. borealis scarce 2

2. Vaccinium globulare well represented . . . . PINUS CONTORTA/VACCINIUM GLOBULARE c.t.* (p.72)
2. V. globulare poorly represented 3

3. Vaccinium scoparium well represented . . . . PINUS CONTORTA/VACCINIUM SCOPARIUM c.t.* (p.72)
3. V. scoparium poorly represented 4

4. Symphoricarpos albus well represented . . . . ABIES LASIOCARPA/SYMPHORICARPOS ALBUS h.t. (p.53)
4. S. albus poorly represented 5

5. Thalictrum occidentale well represented . . . . ABIES LASIOCARPA/THALICTRUM OCCIDENTALE h.t. (p.54)
5. T occidentale poorly represented 6

6. Osmorhiza chilensis or O. depauperata well represented either separately or collectively . . . . ABIES LASIOCARPA/OSMORHIZA CHILENSIS h.t. (p.54)
6. Not as above 7

7. Spiraea betulifolia well represented . . . . PINUS CONTORTA/SPIRAEA BETULIFOLIA c.t.* (p.72)
7. S. betulifolia poorly represented 8

8. Calamagrostis rubescens well represented . . . . PINUS CONTORTA/CALAMAGROSTIS RUBESCENS c.t.* (p.72)
8. C. rubescens poorly represented 9

9. Berberis repens common or Pachistima myrsinites well represented . . . . ABIES LASIOCARPA/BERBERIS REPENS h.t. (p.58)
9. B. repens scarce and P. myrsinites poorly represented 10

10. Carex geyeri well represented . . . . PINUS CONTORTA/CAREX GEYERI c.t.* (p.73)
10. C. geyeri poorly represented 11

11. Juniperus communis well represented . . . . PINUS CONTORTA/JUNIPERUS COMMUNIS c.t.* (p.73)
11. J. communis poorly represented 12

12. Shepherdia canadensis well represented . . . . PINUS CONTORTA/SHEPHERDIA CANADENSIS c.t.* (p.73)
12. S. canadensis poorly represented 13

13. Pedicularis racemosa common . . . . ABIES LASIOCARPA/PEDICULARIS RACEMOSA H.T. (p.60)
13. P. racemosa scarce 14

14. Arnica cordifolia or Astragalus miser well represented . . . . PINUS CONTORTA/ARNICA CORDIFOLIA c.t.* (p.73)
14. A. cordifolia and A. miser poorly represented; Carex rossii well represented or the dominant undergrowth species . . . . PINUS CONTORTA/CAREX ROSSII c.t.* (p.73)

B. Key to Pinus flexilis Habitat Types

1. Juniperus communis well represented . . . . PINUS FLEXILIS/JUNIPERUS COMMUNIS h.t. (p.19)
1. J. communis poorly represented 2

2. Cercocarpus ledifolius well represented . . . . PINUS FLEXILIS/CERCOCARPUS LEDIFOLIUS h.t. (p.19)
2. C. ledifolius poorly represented 3

3. Festuca idahoensis well represented . . . . PINUS FLEXILIS/FESTUCA IDAHOENSIS h.t. (p.20)
3. F. idahoensis poorly represented. Hesperochloa kingii (Leucopoa kingii) common . . . . PINUS FLEXILIS/HESPEROCHLOA KINGII h.t. (p.20)

*C.t.s omitted from charts and tables.

C. Key to Pseudotsuga menziesii Habitat Types

1. Physocarpus malvaceus well represented . . . PSEUDOTSUGA MENZIESII/PHYSOCARPUS MALVACEUS h.t. (p.22)

1a. Pachistima myrsinites usually present, sites south or east of Snake River Plains (fig. 2) . . . PACHISTIMA MYRSINITES phase (p.23)

1b. P. myrsinites absent, sites north or west of Snake River Plains . . . PSEUDOTSUGA MENZIESII phase (p.23)

1. P. malvaceus poorly represented . . . 2

2. Acer glabrum or Sorbus scopulina well represented, sites mainly in the Snake and Bear River drainages (fig 2) . . . PSEUDOTSUGA MENZIESII/ACER GLABRUM h.t. (p.23)

2. A. glabrum and S. scopulina poorly represented, sites not always in Snake and Bear River drainages. . . . 3

3. Vaccinium globulare well represented . . . PSEUDOTSUGA MENZIESII/VACCINIUM GLOBULARE h.t. (p.24)

3. V. globulare poorly represented . . . 4

4. Physocarpus monogynus well represented . . . PSEUDOTSUGA MENZIESII/PHYSOCARPUS MONOGYNUS h.t. (p.25)

4. P. monogynus poorly represented . . . 5

5. Symphoricarpos albus well represented . . . PSEUDOTSUGA MENZIESII/SYMPHORICARPOS ALBUS h.t. (p.25)

5. S. albus poorly represented . . . 6

6. Osmorhiza chilensis or O. depauperata well represented . . . PSEUDOTSUGA MENZIESII/OSMORHIZA CHILENSIS h.t. (p.26)

6. O. chilensis and O. depauperata poorly represented . . . 7

7. Spiraea betulifolia well represented . . . PSEUDOTSUGA MENZIESII/SPIRAEA BETULIFOLIA h.t. (p.26)

7a. Calamagrostis rubescens well represented . . . CALAMAGROSTIS RUBESCENS phase (p.27)

7b. C. rubescens poorly represented . . . SPIRAEA BETULIFOLIA phase (p.27)

7. S. betulifolia poorly represented . . . 8

8. Calamagrostis rubescens well represented . . . PSEUDOTSUGA MENZIESII/CALAMAGROSTIS RUBESCENS h.t. (p.28)

8a. Pachistima myrsinites well represented . . . PACHISTIMA MYRSINITES phase (p.28)

8b. P. myrsinites poorly represented . . . CALAMAGROSTIS RUBESCENS phase (p.28)

8. C. rubescens poorly represented . . . 9

9. Cercocarpus ledifolius well represented . . . PSEUDOTSUGA MENZIESII/CERCOCARPUS LEDIFOLIUS h.t. (p.28)

9. C. ledifolius poorly represented . . . 10

10. Berberis repens or Pachistima myrsinites well represented, either singly or collectively . . . PSEUDOTSUGA MENZIESII/BERBERIS REPENS h.t. (p.30)

10a. Carex geyeri abundant . . . CAREX GEYERI phase* (p.30)

10b. C. geyeri not abundant; Juniperus communis well represenated . . . JUNIPERUS COMMUNIS phase (p.30)

10c. Not as above; Symphoricarpos oreophilus abundant, stands never achieving closed canopies . . . SYMPHORICARPOS OREOPHILUS phase (p.30)

10d. Not as above, stands eventually achieving closed canopies . . . BERBERIS REPENS phase (p.30)

10. B. repens and P. myrsinites poorly represented . . . 11

11. Juniperus communis well represented . . . PSEUDOTSUGA MENZIESII/JUNIPERUS COMMUNIS h.t. (p.33)

11. J. communis poorly represented . . . 12

12. Arnica cordifolia well represented or the dominant forb of normally depauperate undergrowths . . . PSEUDOTSUGA MENZIESII/ARNICA CORDIFOLIA h.t.
-ARNICA CORDIFOLIA phase (p.33)

12. A. cordifolia poorly represented . . . 13

13. Symphoricarpos oreophilus, Prunus virginiana, or Ribes cereum, well represented . . . PSEUDOTSUGA MENZIESII/SYMPHORICARPOS OREOPHILUS h.t. (p.34)

13. S. oreophilus, P. virginiana, and R. cereum poorly represented . . . 14

14. Festuca idahoensis well represented . . . PSEUDOTSUGA MENZIESII/FESTUCA IDAHOENSIS h.t.* (p.35)

14. F. idahoensis poorly represented . . . 15

15. Hesperochloa kingii (Leucopoa kingii) common . . . PINUS FLEXILIS/HESPEROCHLOA KINGII h.t. (p.20)

15. H. kingii scarce; Astragalus miser well represented or the dominant forb of normally depauperate undergrowths . . . PSEUDOTSUGA MENZIESII/ARNICA CORDIFOLIA h.t.
-ASTRAGALUS MISER phase (p.33)

D. Key to Picea Engelmannii Habitat Types

1. Equisetum arvense abundant . . . PICEA ENGELMANNII/EQUISETUM ARVENSIS h.t. (p.36)

1. E. arvense not abundant . . . 2

2. Caltha leptosepala common or Trollius laxus well represented . . . PICEA ENGELMANNII/CALTHA LEPTOSEPALA h.t. (p.37)

2. C. leptosepala scarce and T. laxus poorly represented . . . 3

3. Carex disperma well represented . . . PICEA ENGELMANNII/CAREX DISPERMA h.t. (p.38)

3. C. disperma poorly represented . . . 4

4. Physocarpus malvaceus well represented . . . PICEA ENGELMANNII/PHYSOCARPUS MALVACEUS h.t.* (p.39)

4. P. malvaceus poorly represented . . . 5

5. Galium triflorum, Actaea rubra, or Senecio triangularis common, either individually or collectively . . . PICEA ENGELMANNII/GALIUM TRIFLORUM h.t. (p.39)

5. Not as above . . . 6

6. Linnaea borealis common . . . PICEA ENGELMANNII/LINNAEA BOREALIS h.t. (p.39)

6. L. borealis scarce . . . 7

7. Vaccinium scoparium well represented . . . PICEA ENGELMANNII/VACCINIUM SCOPARIUM h.t. (p.40)

7. V. scoparium poorly represented . . . 8

8. Juniperus communis well represented . . . PICEA ENGELMANNII/JUNIPERUS COMMUNIS h.t. (p.41)

8. J. communis poorly represented . . . 9

9. Ribes montigenum well represented or the dominant plant of normally depauperate undergrowths . . . PICEA ENGELMANNII/RIBES MONTIGENUM h.t. (p.41)

9. Not as above . . . 10

10. Arnica cordifolia well represented . . . PICEA ENGELMANNII/ARNICA CORDIFOLIA h.t. (p.42)

10. A. cordifolia poorly represented; Hypnum revolutum (a prostrate moss) well represented . . . PICEA ENGELMANNII/HYPNUM REVOLUTUM h.t. (p.42)

E. Key to Pinus albicaulis Habitat Types

1. Vaccinium scoparium well represented . . . PINUS ALBICAULIS/VACCINIUM SCOPARIUM h.t. (p.66)

1. V. scoparium poorly represented . . . 2

2. Carex geyeri well represented . . . PINUS ALBICAULIS/CAREX GEYERI h.t. (p.67)

2. C. geyeri poorly represented . . . 3

3. Juniperus communis, Shepherdia canadensis or Astragalus miser well represented or dominant either singly or collectively . . . PINUS ALBICAULIS/JUNIPERUS COMMUNIS h.t. (p.67)

3a. Shepherdia canadensis well represented . . . SHEPHERDIA CANADENSIS phase (p.68)

3b. S. canadensis poorly represented . . . JUNIPERUS COMMUNIS phase (p.68)

3. Not as above . . . 4

4. Pinus contorta well represented . . . PINUS ALBICAULIS/CAREX ROSSII h.t.
-PINUS CONTORTA phase (p.69)

4. P. contorta poorly represented . . . 5

5. Festuca idahoensis common . . . PINUS ALBICAULIS/FESTUCA IDAHOENSIS h.t. (p.69)

5. F. idahoensis scarce . . . PINUS ALBICAULIS/CAREX ROSSII h.t.
-CAREX ROSSII phase (p.69)

*H.t.s and phases incidental to study area and omitted from charts and tables.

F. Key to Abies lasiocarpa habitat types

1. Equisetum arvense abundant . . . . PICEA ENGELMANNII/EQUISETUM ARVENSE h.t. (p.36)
1. E. arvense not abundant 2

2. Caltha leptosepala common or Trollius laxus well represented . . . PICEA ENGELMANNII/CALTHA LEPTOSEPALA h.t. (p.37)
2. C. leptosepala scarce and T. laxus poorly represented 3

3. Carex disperma well represented . . . . PICEA ENGELMANNII/CAREX DISPERMA h.t. (p.38)
3. C. disperma poorly represented 4

4. Calamagrostis canadensis or Ledum glandulosum well represented . . . ABIES LASIOCARPA/CALAMAGROSTIS CANADENSIS h.t. (p.45)
4a. Ledum glandulosum well represented . . . . LEDUM GLANDULOSUM phase* (p.45)
4b. Not as above; Vaccinium caespitosum common . . . . VACCINIUM CAESPITOSUM phase* (p.45)
4c. Not as above in 4a or 4b . . . . CALAMAGROSTIS CANADENSIS phase (p.45)
4. C. canadensis and L. glandulosum poorly represented 5

5. Streptopus amplexifolius or Senecio triangularis well represented either separately or collectively . . . . ABIES LASIOCARPA/STREPTOPUS AMPLEXIFOLIUS h. t.* (p.46)
5. Not as above 6

6. Menziesia ferruginea well represented . . . . ABIES LASIOCARPA/MENZIESIA FERRUGINEA h.t.* (p.47)
6. M. ferruginea poorly represented 7

7. Actaea rubra common . . . . ABIES LASIOCARPA/ACTAEA RUBRA h.t. (p.47)
7. A. rubra scarce 8

8. Physocarpus malvaceus well represented . . . . ABIES LASIOCARPA/PHYSOCARPUS MALVACEUS h.t. (p.48)
8. P. malvaceus poorly represented 9

9. Acer glabrum or Sorbus scopulina well represented either separately or collectively . . . . ABIES LASIOCARPA/ACER GLABRUM h.t. (p.48)
9. Not as above 10

10. Linnaea borealis common . . . . ABIES LASIOCARPA/LINNAEA BOREALIS h.t. (p.49)
10a. Vaccinium scoparium well represented . . . . VACCINIUM SCOPARIUM phase (p.49)
10b. V. scoparium poorly represented . . . . LINNAEA BOREALIS phase (p.49)
10. L. borealis scarce 11

11. Xerophyllum tenax well represented . . . . ABIES LASIOCARPA/XEROPHYLLUM TENAX h.t.* (p.50)
11. X. tenax poorly represented 12

12. Vaccinium globulare well represented . . . . ABIES LASIOCARPA/VACCINIUM GLOBULARE h.t. (p.50)
12a. Vaccinium scoparium abundant . . . . VACCINIUM SCOPARIUM phase (p.50)
12b. V. scoparium not abundant; Pachistima myrsinites usually present, sites mainly south or east of Snake River Plains (fig. 2) . . . . PACHISTIMA MYRSINITES phase (p.50)
12c. P. myrsinites absent, sites mainly north or west of Snake River Plains . . . . VACCINIUM GLOBULARE phase (p.51)
12. V. globulare poorly represented 13

13. Luzula hitchcockii common . . . . ABIES LASIOCARPA/LUZULA HITCHCOCKII H.T.* (p.52)
13. L. hitchcockii scarce 14

14. Vaccinium scoparium well represented . . . . ABIES LASIOCARPA/VACCINIUM SCOPARIUM h.t. (p.52)
14a. Calamagrostis rubescens well represented . . . . CALAMAGROSTIS RUBESCENS phase (p.52)
14b. C. rubescens poorly represented; Pinus albicaulis well represented . . . . PINUS ALBICAULIS phase (p.52)
14c. Not as above in 14a or 14b . . . . VACCINIUM SCOPARIUM phase (p.52)
14. V. scoparium poorly represented 15

15. Arnica latifolia well represented . . . . ABIES LASIOCARPA/ARNICA LATIFOLIA h.t. (p.53)
15. A. latifolia poorly represented 16

16. Symphoricarpos albus well represented . . . . ABIES LASIOCARPA/SYMPHORICARPOS ALBUS h.t. (p.53)
16. S. albus poorly represented 17

17. Thalictrum occidentale well represented . . . . ABIES LASIOCARPA/THALICTRUM OCCIDENTALE h.t. (p.54)
17. T. occidentale poorly represented 18

18. Osmorhiza chilensis or O. depauperata well represented either separately or collectively . . . . ABIES LASIOCARPA/OSMORHIZA CHILENSIS h.t. (p.54)
18a. Pachistima myrsinites well represented . . . . PACHISTIMA MYRSINITES phase (p.55)
18b. P. myrsinites poorly represented . . . . OSMORHIZA CHILENSIS phase (p.55)
18. Not as above 19

19. Spiraea betulifolia well represented . . . . ABIES LASIOCARPA/SPIRAEA BETULIFOLIA h.t. (p.56)
19. S. betulifolia poorly represented 20

20. Calamagrostis rubescens well represented . . . . ABIES LASIOCARPA/CALAMAGROSTIS RUBESCENS h.t. (p.57)
20a. Pachistima myrsinites well represented . . . . PACHISTIMA MYRSINITES phase (p.57)
20b. P. myrsinites poorly represented . . . . CALAMAGROSTIS RUBESCENS phase (p.57)
20. C. rubescens poorly represented 21

21. Beberis repens common or Pachistima myrsinites well represented . . . . ABIES LASIOCARPA/BERBERIS REPENS h.t. (p.58)
21a. Carex geyeri well represented . . . . CAREX GEYERI phase* (p.59)
21b. C. geyeri poorly represented . . . . BERBERIS REPENS phase (p.59)
21. B. repens scarce and P. myrsinites poorly represented 22

22. Carex geyeri well represented . . . . ABIES LASIOCARPA/CAREX GEYERI h.t.* (p.59)
22. C. geyeri poorly represented 23

23. Juniperus communis well represented . . . . ABIES LASIOCARPA/JUNIPERUS COMMUNIS h.t. (p.59)
23. J. communis poorly represented 24

24. Ribes montigenum well represented or the dominant plant of normally depauperate undergrowths . . . . ABIES LASIOCARPA/RIBES MONTIGENUM h.t. (p.60)
24a. Pinus albicaulis well represented . . . . PINUS ALBICAULIS phase (p.60)
24b. P. albicaulis poorly represented . . . . RIBES MONTIGENUM phase (p.60)
24. Not as above 25

25. Pedicularis racemosa common . . . . ABIES LASIOCARPA/PEDICULARIS RACEMOSA h.t. (p.60)
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26. Arnica cordifolia, Astragalus miser, or Shepherdia canadensis well represented or the dominant undergrowth species . . ABIES LASIOCARPA/ARNICA CORDIFOLIA h.t. (p.61)
26a. Picea engelmannii abundant . . . . PICEA ENGELMANNII phase (p.62)
26b. P. engelmannii not abundant; Shepherdia canadensis well represented . . . . SHEPHERDIA CANADENSIS phase (p.62)
26c. Not as above in 26a or 26b; Astragalus miser common . . . . ASTRAGALUS MISER phase (p.62)
26d. Not as above in 26a, 26b or 26c . . . . ARNICA CORDIFOLIA phase (p.65)
26. Not as above in 26; Carex rossii well represented or the dominant undergrowth species . . . . ABIES LASIOCARPA/CAREX ROSSII h.t. (p.65)

*H.t.s and phases incidental to study area and omitted from charts and tables.

Descriptions of Series, Habitat Types and Phases

Pinus flexilis Series

Distribution.—The *Pinus flexilis* series denotes some of the driest sites capable of supporting trees (except *Juniperus*) and its distribution is associated with the continental climatic regime (Pfister and others 1977). This series extends from lower treeline where it supports a savanna of *Pinus flexilis* and other dry-site species such as *Juniperus scopulorum, Bouteloua gracilis*, and *Agropyron spicatum* to upper treeline on calcareous substrates. Tree form and spacing is highly dependent upon site conditions. On very rocky sites at the low elevations, *P. flexilis* has a sprawling form (heights <9 m, 30 feet) and is widely spaced. On more favorable sites where true forest vegetation occurs, the pine's lateral growth is suppressed and its growth form is more upright.

Vegetation.—Peet (1978), working primarily in the Rocky Mountains of Colorado and New Mexico, has noted that *P. flexilis* seems to function as a low-altitude dominant and in the absence of *P. aristata* or *P. albicaulis* extends upslope to become a high-elevation dominant. Though he did not examine its ecology in northwestern Wyoming or Idaho, Peet attributed such range restrictions to competitive interactions and ecologic release. For northwestern Wyoming factors other than competition probably account for the absence of *P. albicaulis* and presence of *P. flexilis* in certain regions. Though we did not statistically test the hypothesis, it appears that these two species have strong substrate preferences, evidence for which is slowly accumulating (Pfister and others 1977; Steele and others 1981; Reed 1976). In the Rocky Mountains, *Pinus flexilis* shows a strong preference for calcareous substrates and reduced success on igneous materials which favor *P. albicaulis*. Where *P. flexilis* rarely co-occurs with *P. albicaulis* at moderate elevations (2 680–2 895 m, 8,800–9,500 feet), *P. albicaulis* may have a slightly greater potential to regenerate through its greater shade tolerance, but there is no evidence of competitive exclusion between *P. albicaulis* and *P. flexilis*.

The actual range of habitats where *P. flexilis* dominates is quite narrow though it is distributed from about 1 830 to 3 050 m (6,000 to 10,000 feet) within the study area. At lower tree line or on south and rocky slopes *P. flexilis* may be the only tree present but is usually joined at lower elevations by *Juniperus scopulorum, J. osteosperma*, and to a limited extent by *Cercocarpus ledifolius*. With increasing elevation, *Pseudotsuga* appears more frequently and the balance between *P. flexilis* and *Pseudotsuga* dominance is very tenuous. At the dry forest margins where stands tend to remain open, *P. flexilis* is not excluded by the more shade tolerant *Pseudotsuga*. Many stands now dominated by *P. flexilis* undoubtedly owe their existence to animal seed caches; the most instrumental agent is probably Clarks nutcracker, which transports the wingless seed long distances and caches them on exposed, windswept sites (Lanner and Vander Wall 1980, Lanner 1980). Once such a stand is established at the dry forest margin it is difficult for *Pseudotsuga* to invade the site. Stands thus created, combined with the random effects of fire have maintained a mosaic of vegetation dominated by either *P. flexilis* or *Pseudotsuga* and combinations of the two; this mosaic obviously cannot be understood in terms of site-vegetation relationships alone. *Pinus flexilis* extends as an important seral species (on calcareous substrates) from the *Pseudotsuga* to the *Picea* series. Rarely, it occurs in the *Abies lasiocarpa* series as a minor seral species on the driest sites.

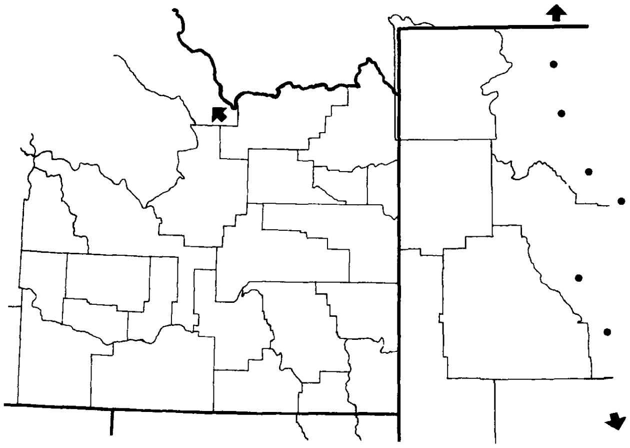
Where *P. flexilis* is the potential climax, it is superimposed over a shrub steppe or grassland community, thus reducing the undergrowth coverage. *Artemisia tridentata* (usually subspecies *vaseyana*), which strongly dominates postfire succession, is shaded out. More shade-tolerant shrubs, such as *Symphoricarpos oreophilus* and *Juniperus communis*, remain in the undergrowth. Caespitose graminoids, such as *Festuca idahoensis, Agropyron spicatum, Hesperochloa kingii*, or *Carex rossii* may be undergrowth dominants at lower treeline and may maintain their importance to upper treeline on dry exposures. On adjacent drier sites or sites of deep, fine-textured soils (less rock), shrub-steppe or grassland prevails.

Soils/Climate.—Rocky sites with shallow, patchy, duff accumulations and highly erosive soils typify this series. These soils may develop dark surface horizons which reflect a high charcoal content as well as the influence of grasses and forbs. The soils are usually near neutral to slightly basic, reflecting their development on calcareous substrates (appendix D-1). In the Gros Ventre Range, however, *P. flexilis* occurs on red and grey alkaline clay soils (Earle Layser, consultant, Pers. Comm.).

The weather station at Dubois, Wyo. (appendix D-2) approximates the climate of *P. flexilis* savanna that occurs on nearby "bad lands" topography. The Yellowstone Park (Mammoth, Wyo.) station is near a stand of the *PIFL/HEKI* h.t. (appendix D-2). Because virtually all stands of this series are topographic or edaphic climaxes, no conventional weather station can adequately portray the evapotranspirational demand and moisture supply of these sites.

Productivity/Management.—Timber productivity is very low to low, owing to low site indexes and poor form of both *Pinus flexilis* and *Pseudotsuga* and low stockability as denoted by low basal areas. Forage yield is highest where caespitose graminoids dominate early seral stages but decreases drastically with increasing overstory cover on all h.t.'s. The large *P. flexilis* seeds are an important food source for rodents and birds, some of which cache the seeds, and for bears which pilfer the caches. Unexcavated caches may be an important means of *P. flexilis* reproduction.

Pinus Flexilis/Juniperus Communis h.t. (*PIFL/JUCO;* Limber Pine/Common Juniper)



Distribution.—This minor h.t. appears only on the eastern margin of the study area but ranges into Montana, east-central Idaho, and northwestern Colorado. It occurs on various aspects from about 2 134 to 2 895 m (7,000 to 9,500 feet) and generally appears at low to mid-elevations of the forested zone. Adjacent drier sites are either non-forest h.t.'s or other *Pinus flexilis* h.t.'s. Adjacent more moist sites may be in the *Pseudotsuga, Picea*, or *Abies* series.

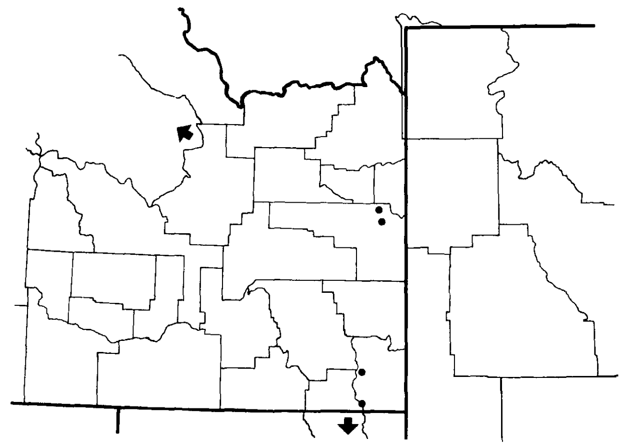
Vegetation.—On some noncalcareous sites (particularly sandstones), *Pinus contorta* is a minor species thus indicating that these sites are the most moist of the *PIFL* h.t.'s. Otherwise, *Pinus flexilis*, often mixed with *Pseudotsuga* dominate both seral and climax stands. *Juniperus communis* is well represented in patches and is joined occasionally by *Shepherdia canadensis*. The relatively high constancy of *Arnica cordifolia* and low constancies of *Hesperochloa kingii* and *Agropyron spicatum* reflect the relatively cool moist position of this h.t. in the *Pinus flexilis* series.

Soils.—Sampled soils were derived mainly from limestone and calcareous sandstone but also from quartzite-sandstone mixtures, basalt, and granitics. Soil pH ranged from 4.8 to 7.6 and averaged 6.3. Areas of bare rock reached 20 percent on some sites but areas of bare soil were less than 1 percent. Average litter depths on a site reached 6 cm (2.4 in).

Productivity/Management.—Timber production is very low (appendix E-2) and tree regeneration is sporadic. Most sites have some stockability limitations. In some areas, cattle make light use of these sites and deer and elk use them for cover.

Other Studies.—Pfister and others (1977) have described this h.t. for Montana ranges east of the Continental Divide. Hoffman and Alexander (1980) and Hess (1981) have described *PIFL/JUCO* in northern Colorado.

Pinus Flexilis/Cercocarpus Ledifolius h.t. (*PIFL/CELE;* Limber Pine/Curl-Leaf Mountain-Mahogany)



Distribution—*PIFL/CELE* is a minor h.t. that occurs sporadically from east-central Idaho to northern Utah. It extends roughly from 1 829 to 2 590 m (6,000 to 8,500 feet) and usually occupies rocky west-facing to south-facing slopes. Normally this h.t. represents the lower limits of forest trees and merges with *Cercocarpus* dominated communities or shrub steppe communities on adjacent drier sites. Adjacent more moist sites are usually in the *Pseudotsuga* series.

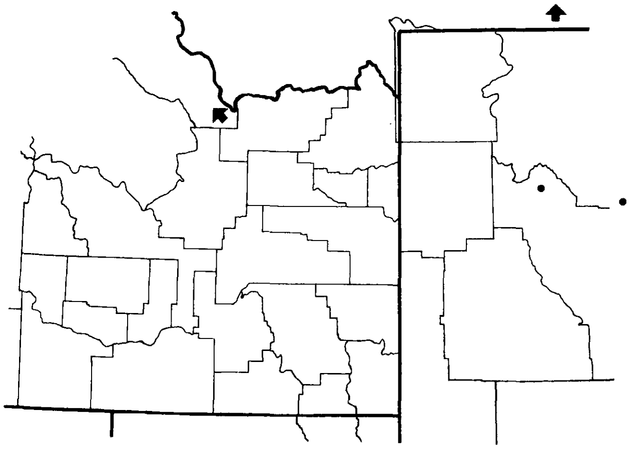
Vegetation.—Open stands of *P. flexilis*, often with *Pseudotsuga*, dominate a somewhat discontinuous layer of *Cercocarpus*. *Juniperus scopulorum* sometimes occurs, appearing comparatively robust, due to the open nature of the stands. *Berberis repens, Symphoricarpos oreophilus*, and *Artemisia tridentata* are common shrubs of widely varying coverage. *Hesperochloa kingii* and *Agropyron spicatum* are the most important grasses and their cover is inversely related to that of the trees and shrubs.

Soils.—Soil parent materials are usually sandstone and limestone. Soil pH data are lacking. Areas of bare rock reached 35 percent and that of bare soil 10 percent. Average litter depth per site reached 9 cm (3.5 in) but was normally about 1 cm (0.4 in).

Productivity/Management.—Timber potentials are quite low (appendix E-2) and regeneration is sporadic. *Cercocarpus* seedlings were not encountered and, in some areas, the size class distribution suggests that *Cercocarpus* may require fire for regeneration (Dealy 1975). The greatest value of existing trees may be the food and cover they provide for rodents, birds, and big game. *Cercocarpus* provides big game with winter cover and important browse but may limit production of forbs and grasses.

Other Studies.—The *PIFL/CELE* h.t. was previously recognized in northern Utah and adjacent Idaho (Henderson and others 1976 unpubl.). It is also described in east-central Idaho (Steele and others 1981).

Pinus Flexilis/Festuca Idahoensis h.t. (*PIFL/FEID;* Limber Pine/Idaho Fescue)



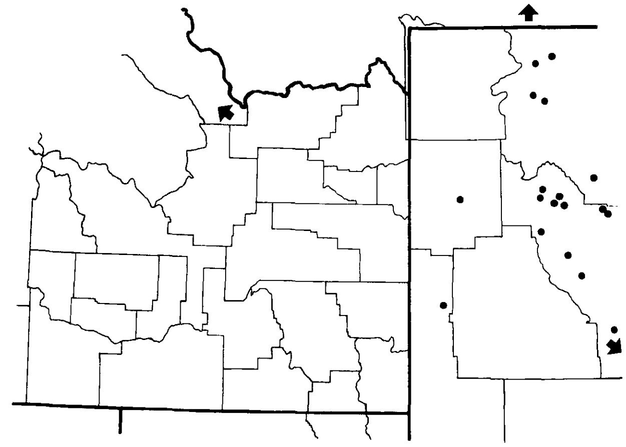
Distribution.—*PIFL/FEID* is a minor h.t. in the study area and appears mainly in the Absaroka and Owl Creek Ranges of western Wyoming. It shows better development in south-central Montana and east-central Idaho. In the study area, this h.t. ranges from about 2 347 to 2 590 m (7,700 to 8,500 feet) and usually represents a lower timberline condition. At its dry extreme *PIFL/FEID* occurs as small patches bordering nonforest communities. At the moist extreme it borders the driest h.t.'s of the *Pseudotsuga* and *Picea* series.

Vegetation.—*Pinus flexilis* and *Pseudotsuga* may be codominant in these open stands. *Festuca idahoensis* is well represented in the undergrowth and is often accompanied by *Agropyron spicatum* and *Hesperochloa kingii*. Common forbs include *Balsamorhiza sagittata* and *Crepis acuminata*. Shrubs are generally sparse.

Productivity/Management.—Timber potentials are low to very low (appendix E-2) and tree regeneration is sporadic and unpredictable. These sites also have stockability limitations. Cattle make some use of the forage on these sites and in some areas big game use the sites for winter range.

Other Studies.—In Montana, Pfister and others (1977) described two phases of *PIFL/FEID*. Only the *Festuca idahoensis* phase occurs in the study area and it appears comparable to that described in Montana. Small areas of *PIFL/FEID* also occur in east-central Idaho (Steele and others 1981).

Pinus Flexilis/Hesperochloa Kingii h.t. (*PIFL/HEKI;* Limber Pine/Spike-Fescue)



Distribution.—*PIFL/HEKI* is the most common h.t. of this series. It occurs mainly in the Absaroka and Wind River Ranges and extends to the Medicine Bow Range in southeastern Wyoming. Small amounts also appear in extreme southern Montana and east-central Idaho. Although this h.t. was found as low as 1 585 m (5,200 feet), most stands occur from about 2 195 to 2 804 m (7,200 to 9,200 feet). *PIFL/HEKI* occupies severe, droughty sites on all aspects, but is usually most extensive on southeast to southwest exposures and may extend from lower to upper treeline on these dry slopes. It frequently exists as a narrow strip between drier sites dominated by nonforest communities and more moist slopes dominated by *Pseudotsuga, Picea*, or *Abies*.

Vegetation.—Widely spaced *P. flexilis*, often accompanied by *Pseudotsuga*, create a savanna-like aspect (fig. 3). In some areas, *Juniperus scopulorum* is a minor component of the tree layer. *Hesperochloa kingii*, often accompanied by *Agropyron spicatum*, codominate the undergrowth and *Carex rossii* is often present. Forb coverages are generally low but occasionally *Astragalus miser, Balsamorhiza sagittata*, or *Crepis acuminata* are well represented. *Artemisia tridentata, Ribes cereum*, and *Symphoricarpos oreophilus* are the only shrubs that frequently occur in this h.t. and their coverages are usually quite low.

Soils.—Soil parent materials were primarily limestones and sandstones but included rhyolite, andesite, basalt, quartzite, granitics and mixtures of these materials. The pH of soils derived from limestone averaged 7.3 (range from 6.7 to 8.1) whereas that of other parent materials averaged 6.8 (range 6.2 to 7.8). Areas of bare rock reached 20 percent and that of bare soil 30 percent. These values are near the high end of a continuum of forest site conditions and reflect the open, steep, and often rill eroded nature of these sites. Average litter depth per site seldom exceeded 6 cm (2.4 in).

Figure 3.—*Pinus flexilis/Hesperochloa kingii* h.t. in the Bear Creek drainage at the southern end of the Absaroka Range (2 697 m, 8,850 feet). This southwesterly slope represents a dry extreme of the type. *Pinus flexilis* is the only tree present; *Artemisia tridentata* and *Hesperochloa kingii* dominate the undergrowth.

Productivity/Management.—Timber potentials appear low to very low (appendix E-2) due to low stockability and slow height growth. Though this h.t. occurs adjacent to well used rangeland, cattle appear to use it only when slopes are not steep. *PIFL/HEKI* may occur in big game winter range; in local areas along the Hoback and Gros Ventre Rivers, mule deer and bighorn sheep use these sites heavily.

Other Studies.—Cooper (1975) described this h.t. in the study area as the *PSME-PIFL/HEKI* h.t. Pfister and others (1977) note that the portion of their *Pinus flexilis/ Agropyron spicatum* h.t. in southern Montana contains *Hesperochloa* and is similar to *PIFL/HEKI*. The *PIFL/HEKI* h.t. is also described in the Medicine Bow Mountains of southeastern Wyoming (Wirsing and Alexander 1975) and small amounts appear in east-central Idaho (Steele and others 1981).

Pseudotsuga menziesii Series

Distribution.—The *Pseudotsuga menziesii* series ranges from about 1 646 m (5,400 feet) along the Snake River to 2 896 m (9,500 feet) in the Wind River Range and forms the lower timberline in much of the study area. Exceptions are found in the Cassia division of the Sawtooth National Forest where naturally occurring *Pseudotsuga* is inexplicably absent and in portions of the Wind River and Absaroka ranges where the climate is too cold or where the substrate is unsuitable, such as rhyolite or granitics. The *Pseudotsuga* series is most extensive in the eastern Idaho portion of the study area but diminishes eastward as a result of increasing base elevations and, near its eastern limits, the unsuitable substrates. At its warm, dry extreme, the *Pseudotsuga* series merges with mountain shrub communities containing *Cercocarpus, Prunus* or *Symphoricarpos oreophilus* or steppe vegetation containing *Agropyron spicatum, Festuca idahoensis*, or *Hesperochloa*. At the cool, moist extreme, it meets either the *Picea engelmannii* or *Abies lasiocarpa* series.

As Cooper (1975) noted, several species characteristic of *Pseudotsuga* h.t.'s in Idaho and Montana become scarce in parts of the study area. *Symphoricarpos oreophilus*, a ubiquitous species of *Pseudotsuga* h.t.'s in central and southern Idaho, is largely absent in the northeastern portion of the study area. *Symphoricarpos albus* is common in the north and extends southward to about the latitude of Alpine, Wyo. *Calamagrostis rubescens*, a widespread species, becomes scarce in eastern portions of the study area and is absent throughout much of the Wind River

Range. *Pachistima myrsinites*, extending northward from Utah and Colorado, shows good development to about the latitude of Driggs, Idaho. It also has spotty occurrences in Yellowstone Park and near Hebgen Lake in southern Montana. The geographic limits of these indicator species, some extending from different regions, reflect the convergence of different environmental and floristic elements within the study area.

Vegetation.—*Pinus contorta* is the major seral conifer in part of this series and small amounts of *Pinus flexilis* appear in some h.t.'s (appendix B). In a few types, *Populus tremuloides* dominates seral stands, but in many areas only *Pseudotsuga* appears capable of occupying the site. Undergrowths can vary from dense layers of tall shrubs to a sparse cover of low forbs or dry-site grasses.

Soil/Climate.—In most of the study area the *Pseudotsuga* series normally represents the warmer, lower elevation zone of the forest. In some areas, however, *Pseudotsuga* is also dependant on substrate. Then it exhibits a strong preference for limestone and basic extrusive volcanics, particularly andesite and basalt. *Pseudotsuga* is weakly represented on granitics and acidic extrusives such as rhyolite. These relationships are most evident on the eastern flank of the Wind River and Absaroka Ranges which have the strongest continental climatic pattern in the study area. Similar relationships are also noted in the Bighorn Mountains to the east (Despain 1973). Where granitics or rhyolite are prevalent in these areas, *Picea, Abies*, or *Pinus contorta* communities often form the lower timberline.

Fire.—Fire has repeatedly altered most vegetation in the *Pseudotsuga* series. Fire-induced communities vary considerably with h.t., but high coverages of *Pinus contorta, Populus tremuloides, Shepherdia canadensis, Ceanothus velutinus*, and *Calamagrostis rubescens* may indicate a history of severe or repeated burning. In some h.t.'s these species, commonly associated with recent burning, will not appear. Instead, vegetation on adjacent more severe sites, such as the mountain shrub communities, simply invades the newly burned area.

Productivity/Management.—Productivity and management vary widely in this series and are best noted in the h.t. descriptions. Nevertheless, a few generalities apply to portions of this series.

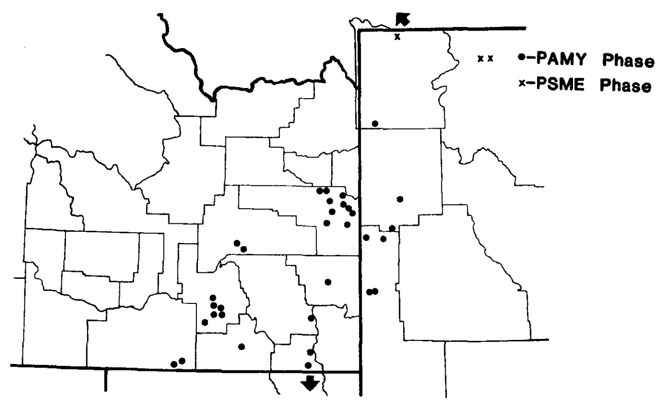
Where *Pinus contorta* is the major seral tree, usually it can be regenerated faster and more easily than *Pseudotsuga*. On these sites *P. contorta* should regenerate adequately in clearings that receive full sunlight. In most areas, many of the cones are nonserotinous, thus burning may only be needed to dispose of slash or trees infested with disease or insects.

Populus tremuloides is a major seral species in the southern half of the study area. When conifers are removed, the *Populus* may quickly dominate these sites and severely restrict establishment and growth of conifer seedlings. Timber harvest methods that maintain a conifer canopy will suppress development of *Populus*-dominated stands.

In much of the study area, *Calamagrostis rubescens* responds to fire or logging and develops a dense sod that hinders tree regeneration. These conditions often require careful site preparation before tree seedlings will become established. Although chemicals will effectively destroy the sod (Stewart and Beebe 1974), thorough scarification should be adequate for establishing *Pinus contorta* in the study area.

In southern portions of the study area, *Carex rossii* may invade recent clearcuts before they are adequately restocked. Foliar coverage of the *Carex* can be deceptively low and appear as insignificant competition for tree seedlings. In reality, the *Carex* occupies a much larger soil volume than its foliage would indicate and may be fully occupying the site. In these cases, some form of scarification may be needed to attain adequate tree stocking.

Pseudotsuga menziesii/Physocarpus malvaceus h.t. (*PSME/PHMA;* Douglas-fir/ninebark)



Distribution.—*PSME/PHMA* is a minor h.t. within the study area but is common at low elevations in the Snake, Hoback, and Greys River drainages. It also extends intermittently southward into the Bear River drainage and northward into the Yellowstone drainage. *PSME/PHMA* occurs mainly on steep northerly aspects and other moist, protected slopes from 1 646 to 2 286 m (5,400 to 7,500 feet). It represents moderate environments at low to mid-elevations of the forested zone.

Vegetation.—Normally *Pseudotsuga* dominates both seral and old growth stands. In the seral stands, small amounts of *Pinus flexilis* and occasionally *Populus tremuloides* may appear but *Pinus contorta* seldom grows here. *Physocarpus malvaceus* usually forms a dominant layer in the undergrowth.

Pachistima myrsinites (*PAMY*) phase.—The *PAMY* phase occurs from about 1 646 to 2 073 m (5,400 to 6,800 feet) in the Snake, Hoback, Greys and Bear River drainages. It also extends southward into Utah. *Pachistima* is usually present and often well represented. This phase represents a geographic variant of the *PSME/PHMA* h.t.

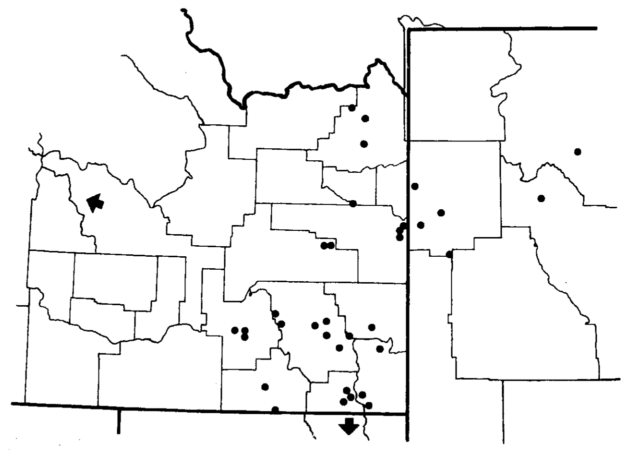
Pseudotsuga menziesii (*PSME*) phase.—In the study area, the *PSME* phase occurs mainly in the Yellowstone River drainage, where it ranges from about 1 920 to 2 286 m (6,300 to 7,500 feet). It also extends from southern Montana to east-central Idaho. In some areas, the upper limits of this phase grade into a *PIEN/PHMA* h.t.

Soils.—Soils in the *PAMY* phase were derived mainly from limestone and sandstone. Those in the *PSME* phase were derived mainly from andesite and occasionally limestone. Soil pH ranged from 6.6 to 7.5 and averaged 7.0 in the *PAMY* phase. There is insufficient pH data for the *PSME* phase. In both phases, coverages of bare rock and soil were usually less than 5 percent and average litter depth on a site reached 10 cm (3.9 in).

Productivity/Management.—*Pseudotsuga* is the most suitable timber species for these sites. It appears to regenerate readily in small openings but growth rates are low to moderate (appendix E). If the tree canopy is removed, the shrub layer may increase and suppress conifer seedlings. This is especially true when insects or wildfire kill the trees and the site is left unscarified. Domestic livestock find little forage here but big game may use these sites for cover and escape. The low elevations of these sites may attract heavy big game use in winter even though suitable browse is often scarce on timbered sites. *Acer, Amelanchier, Salix*, and *Pachistima* (appendix C) may be important browse species on nontimbered sites.

Other Studies.—Cooper (1975) and Henderson and others (1976 unpubl.) have previously described this h.t. within the study area. *PSME/PHMA* is a major h.t. in Montana (Pfister and others 1977), central Idaho (Steele and others 1981), and northern Idaho (Daubenmire and Daubenmire 1968).

Pseudotsuga menziesii/Acer glabrum h.t. (*PSME/ACGL*; Douglas-fir/mountain maple)



Distribution.—This h.t. is best developed in the southeastern quarter of Idaho and in adjacent Wyoming and parts of northern Utah. Other phases of this type extend through much of central Idaho. The *Pachistima myrsinites* (*PAMY*) phase serves as a geographic distinction for the study area. The *PSME/ACGL* h.t., *PAMY* phase occurs from about 1 829 to 2 530 m (6,000 to 8,300 feet) on moist, northerly aspects that are often quite steep. These sites normally represent low to middle elevations of the *Pseudotsuga* series and appear cooler than the *PSME/PHMA* h.t.

Vegetation.—Generally, *Pseudotsuga* is the dominant tree in all successional stages. Occasionally small amounts of *Populus tremuloides* or *Pinus flexilis* may be present. A tall layer of *Acer, Amelanchier*, and *Prunus* dominates seral undergrowths. Toward climax, *Acer glabrum* or *Sorbus scopulina* becomes the dominant shrub (fig 4). *Pachistima* and *Berberis* are usually present though often sparse. Numerous forbs are often present, of which *Arnica, Osmorhiza*, and *Galium triflorum* are most common. *Calamagrostis rubescens* and *Carex geyeri* are often conspicuous. This h.t. may represent the most moist uplands in the area or it may border the *ABLA/ACGL* or *ABLA/ACRU* h.t.'s. Adjacent drier sites are usually *PSME/OSCH* or *PSME/CARU* h.t.'s or sometimes support *Acer grandidentatum* communities.

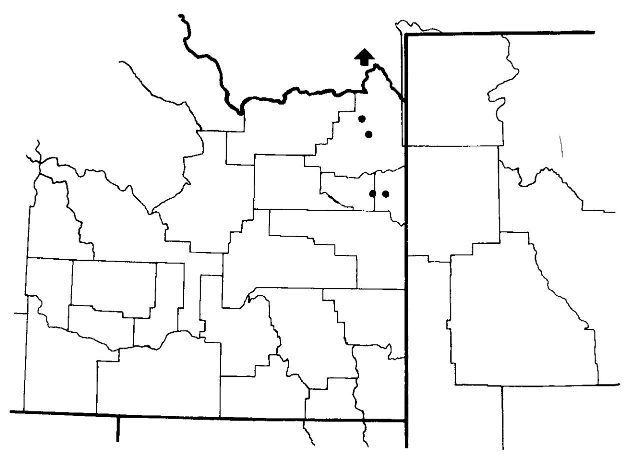
Soils.—*PSME/ACGL* was found mainly on sedimentary soil parent materials and many of these were also calcareous. Soil pH ranged from 6.0 to 7.2 and averaged 6.6. Areas of bare rock varied considerably and reached 50 percent. Areas of bare soil are usually less than 2 percent. Average litter depth on a site reached 7 cm (2.8 in.).

Figure 4.—*Pseudotsuga menziesii/Acer glabrum* h.t., *Pachistima* phase on a north slope in upper Wolverine Canyon southeast of Idaho Falls, Idaho (2 164 m, 7,100 feet). *Pseudotsuga* has formed a pure, all-aged stand on the site. Large sprawling *Acer* dominate the undergrowth; the less tolerant shrubs *Amelanchier and Prunus* are declining. *Arnica cordifolia* is the conspicuous forb.

Productivity/Management.—*Pseudotsuga* is the best suited timber species. Its productivity is moderate (appendix E-2). The seedlings should establish best in small openings protected from severe sun and wind. Overstory removal may stimulate development of a tall shrub layer that is beneficial to big game but may retard the growth of conifer seedlings. Domestic livestock seldom use these sites because of the steep slopes and more desirable forage in adjacent areas.

Other Studies.—Henderson and others (1976 unpubl.) previously described this h.t. in southeastern Idaho. In central Idaho, a *Symphoricarpos oreophilus* phase and an *Acer glabrum* phase were recognized (Steele and others 1981). Hoffman and Alexander (1980) describe a *Pseudotsuga menziesii/Pachistima myrsinites* h.t. in northwestern Colorado that appears related to the *PSME/ACGL* h.t., *PAMY* phase.

Pseudotsuga menziesii/Vaccinium globulare h.t. (*PSME/VAGL*; Douglas-fir/blue huckleberry)



Distribution.—This minor h.t. occurs mainly in Montana but was found on the Targhee National Forest from the Centennial Mountains south to the Snake River Range. It occurs from about 1 951 to 2 255 m (6,400 to 7,400 feet) on moderately steep slopes having northerly aspects.

Vegetation.—*Pinus contorta* is a major seral tree in this h.t. and usually invades following fire. *Pseudotsuga* is the only other tree normally found here. *Vaccinium globulare* usually dominates a shrubby undergrowth that includes *Spiraea betulifolia* and *Lonicera utahensis*. *Calamagrostis rubescens* is usually present.

Productivity/Management.—*Pinus contorta* should regenerate readily wherever the tree canopy is removed and the seedbed is suitable. *Pseudotsuga* seedlings may benefit from a light tree canopy, but the undergrowth of shrubs and grass can impede their establishment. In summer and fall, big game may seek food and cover on these gentle northerly aspects and the fall berry crops attract bears, grouse and humans. Occasional spring burning of the undergrowth (Miller 1977) and a partial tree canopy may provide the best maintenance for berry production.

Other Studies.—Cooper (1975) first described *PSME/VAGL* from this area. Several phases of this h.t. occur in Montana (Pfister and others 1977) and occasionally in central Idaho (Steele and others 1981). Only the *Vaccinium globulare* phase occurs in the study area.

Pseudotsuga menziesii/Physocarpus monogynus h.t. (*PSME/PHMO;* Douglas-fir/mountain ninebark)

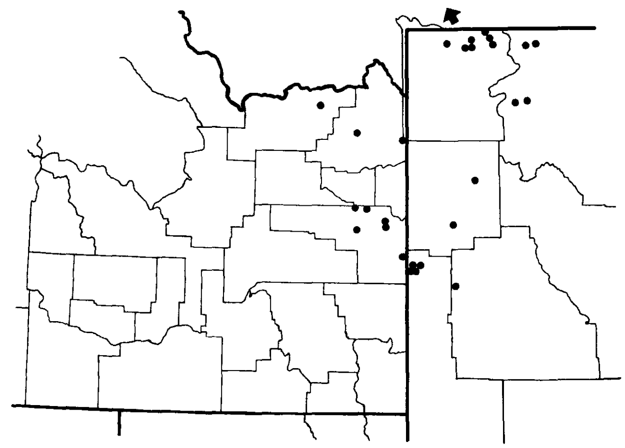
Distribution.—This incidental h.t. occurs mainly in the Bighorn Mountains of Wyoming. In our study area it was found only in the Wind River Canyon. Here it occupies steep north aspects at about 1 859 m (6,100 feet). Observations of *PSME/PHMO* in the Bighorn Mountains suggest that it is a geographic replacement of the *PSME/PHMA* h.t., *PSME* phase, which it strongly resembles in appearance and topographic position.

Vegetation.—*Pseudotsuga* dominates the site, with small amounts of *Pinus flexilis* and *Juniperus scopulorum* scattered throughout. *Physocarpus monogynus* dominates the undergrowth. Only small amounts of other shrubs or forbs are present, but there is a notable moss layer. *P. monogynus* strongly resembles *P. malvaceus*; mature fruits are needed for positive identification (see Taxonomic Considerations).

Productivity/Management.—Although general management guidelines may follow those of *PSME/PHMA* h.t., *PSME* phase, the overall productivity and vegetal response in *PSME/PHMO* may be considerably less, due to a more severe environment. *Pseudotsuga* is the only suitable timber species for these sites. Its regeneration may be sporadic and may face severe competition from the layer of *Physocarpus*. These sites may occur near big game wintering areas and provide important cover but forage values are probably lower than in *PSME/PHMA* because the seral browse species *Acer, Amelanchier*, and *Salix* are normally lacking.

Other Studies.—*PSME/PHMO* is reported from the Bighorn Mountains of Wyoming (Hoffman and Alexander 1976) and the Front Range of Colorado (Hess 1981).

Pseudotsuga menziesii/Symphoricarpos albus h.t. (*PSME/SYAL;* Douglas-fir/common snowberry)



Distribution.—*PSME/SYAL* occurs as a minor type from about Alpine, Wyo., northward into Montana and northwestern Wyoming. It occupies low elevation slopes and benches having relatively mild climates and deep moist soils. *PSME/SYAL* appears most often from 1 737 to 2 255 m (5,700 to 7,400 feet) on southerly to easterly aspects. Adjacent cooler sites are usually an *Abies lasiocarpa* h.t. and adjacent drier sites are usually a *PSME/CARU* or nonforest h.t.

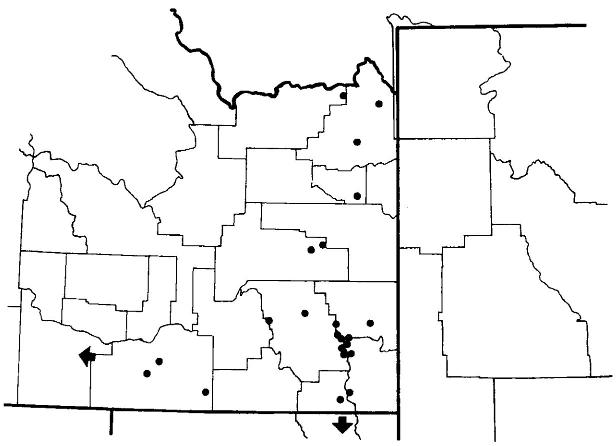
Vegetation.—*Populus tremuloides, Pinus contorta* and small amounts of *Pinus flexilis* are the common seral trees in various portions of the h.t. *Pseudotsuga* usually codominates with these species in the later seral stages. Usually *Symphoricarpos albus* forms a low shrub layer with *Spiraea betulifolia* and *Berberis repens*. *Prunus* and *Amelanchier* are often present. On some sites, *Calamagrostis rubescens* forms a layer beneath the shrubs.

Soils.—Soil parent materials were mainly limestone, sandstone, or basic volcanics. Soil pH ranged from 5.9 to 7.5 and averaged 6.7. Areas of bare soil and rock were usually less than 2 percent. Average litter depth on a site reached 10 cm (3.9 in.), but was normally closer to 4 cm (1.6 in).

Productivity/Management.—On most sites, *Pseudotsuga* is the only species suitable for timber production and its productivity ranges from low to moderate (appendix E-2). It should regenerate well in small, protected openings. If *Populus tremuloides* is present, the *Populus* may increase rapidly after conifers are burned or harvested and retard growth of *Pseudotsuga* seedlings. Young shoots of *Populus* can provide browse for big game and sometimes such sites are important wintering areas. Domestic livestock show little preference for these sites but may use them as resting areas.

Other Studies.—Cooper (1975) first described a *PSME/SYAL* h.t. in this area, but he defined a much broader unit than recognized here. Although several phases of *PSME/SYAL* are reported from Montana (Pfister and others 1977) and central Idaho (Steele and others 1981), only the *Symphoricarpos albus* phase is recognized in our study area. *PSME/SYAL* also occurs in northern Idaho (Daubenmire and Daubenmire 1968).

Pseudotsuga menziesii/Osmorhiza chilensis h.t. (*PSME/OSCH;* Douglas-fir/mountain sweet-root)



Distribution.—*PSME/OSCH* is a major h.t. across the southern portion of Idaho and into northern Utah. It also extends sporadically northward to Montana. It ranges from 1 768 to 2 377 m (5,800 to 7,800 feet) and usually appears on the slopes of ridges that are adjacent to the Snake River Plain or related desert. The slopes in general are moderate to steep and have northerly aspects. Most sites occur near lower timberline and adjacent warmer sites are often nonforested.

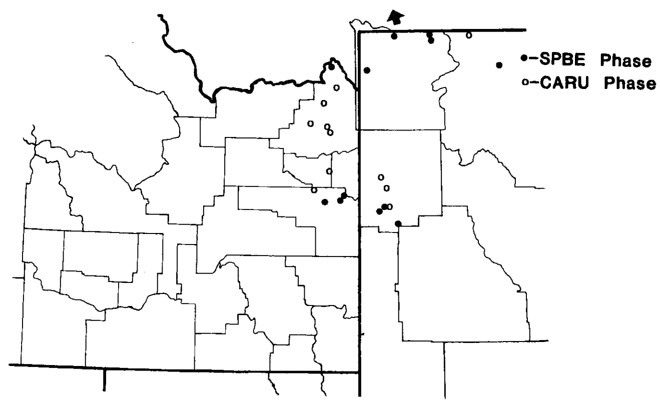
Vegetation.—Normally *Pseudotsuga* is the only conifer on these sites although an occasional *Abies lasiocarpa* may be present. *Populus tremuloides* and sometimes *Pinus contorta* may dominate seral stands. Members of adjacent mountain shrub communities, which may include *Prunus virginiana, Symphoricarpos oreophilus, Amelanchier alnifolia*, and *Acer grandidentatum*, can also invade disturbed sites (fig. 5). *Osmorhiza chilensis*, or sometimes *O. depauperata* usually dominates a layer of forbs that includes *Smilacina racemosa* and *Viola nuttallii*. The moss, *Eurhynchium pulchellum*, appears frequently in this h.t., particularly on the bases of trees. Where the *PSME/CARU* or *PSME/CAGE* h.t. is nearby on drier sites, *Calamagrostis* or *Carex* may be well represented, especially in younger stands.

Soils.—Soil parent materials are mainly sedimentary and include sandstone, shale, and quartzite. Soil pH varies from 5.3 to 6.6 and averages 6.0. Areas of bare rock and soil are usually less than 2 percent. Average litter depths on a site can reach 9.5 cm (3.7 in).

Productivity/Management.—Timber productivity ranges mostly from moderate to high in this h.t. (appendix E-2). *Pseudotsuga* is often the only conifer adapted to the site and regenerates well in the shade of older trees. If present, *Populus tremuloides* can quickly dominate cleared areas in this h.t. Pocket gophers are sometimes numerous and can pose a threat to young conifers. Domestic livestock often use these sites for resting and shelter but seldom find much forage here. Big game use is normally light but may increase in early seral stages.

Other Studies.—This h.t. was first described in the southern Sawtooth National Forest (Steele and others 1974 unpubl.). It was subsequently recognized by Henderson and others (1976 unpubl.) in our study area and by Steele and others (1981) in central Idaho. No other studies have reported a *PSME/OSCH* h.t.

Pseudotsuga menziesii/Spiraea betulifolia h.t. (*PSME/SPBE;* Douglas-fir/white spirea)



Distribution.—This minor h.t. occurs from about Alpine, Wyo., northward to Yellowstone Park and into Montana. It ranges from about 1 829 to 2 499 m (6,000 to 8,200 feet) on upper slopes and ridges having various aspects. *PSME/SPBE* normally represents a mid-elevation segment of the *Pseudotsuga* series.

Figure 5.—*Pseudotsuga menziesii/Osmorhiza chilensis* h.t. on a gentle north slope on Scout Mountain south of Pocatello, Idaho (1 996 m, 6,550 feet). All-age *Pseudotsuga* and an occasional *Populus tremuloides* comprise the tree layer. Scattered intolerant shrubs, *Symphoricarpos oreophilus, Amelanchier*, and *Prunus* are slowly declining. *Osmorhiza* dominates a conspicuous layer of forbs.

Vegetation.—Occasionally *Pinus contorta* grows here as a seral species and codominates the site with *Pseudotsuga*. In many areas, however, *Pseudotsuga* dominates both seral and old-growth stands. Normally, *Spiraea betulifolia* is a major component of a low shrub layer that sometimes includes high coverages of *Pachistima*. Lesser amounts of *Amelanchier* and *Symphoricarpos oreophilus* are also common.

Calamagrostis rubescens (*CARU*) phase.—This phase was found from 1 829 to 2 408 m (6,000 to 7,900 feet) and often occurs in the same area as the *SPBE* phase. Thus it appears influenced by minor differences in soil and temperature. *Pinus contorta* is more abundant here than in the *SPBE* phase. A conspicuous layer of *Calamagrostis rubescens* often mixed with *Carex geyeri* is the characteristic feature of the *CARU* phase. It is often transitional to a *PSME/CARU* or *ABLA/CARU* h.t. and its vegetal response to disturbance is apt to be similar to these types. *Populus tremuloides* may occur in small amounts but shows limited potential for colonizing the site.

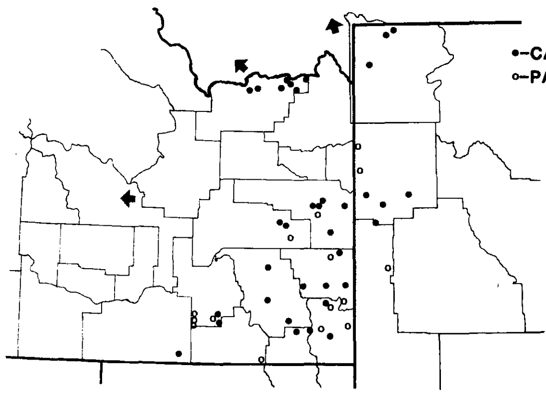
Spiraea betulifolia (*SPBE*) phase.—This phase was found from 2 012 to 2 499 m (6,600 to 8,200 feet) and occurs throughout the distribution of the h.t. Small amounts of *Pinus flexilis* may be present in this phase. Otherwise it fits the description given for the h.t.

Soils.—Soil parent materials included limestone, sandstone, quartzite and andesite. The pH ranged from 5.7 to 6.7 and averaged 6.3. Areas of bare rock varied but reached 20 percent. Areas of bare soil were generally nil. Average litter depths on a site reached 9 cm (3.5 in).

Productivity/Management.—Timber productivity potential is low to moderate (appendix E-2). *Pseudotsuga* is the only suitable timber species for many of these sites and may require careful site preparation for adequate restocking, especially in the *CARU* phase. Seedlings may require small openings that provide protection from wind or sun. If present, *Pinus contorta* may be a more feasible species for regenerating the stand and will establish in larger openings. Most of these sites receive light use from big game, but in some areas they receive heavy winter use. Domestic livestock use this h.t. sparingly.

Other studies.—The *PSME/SPBE* h.t. is also reported from Montana (Pfister and others 1977) and central Idaho (Steele and others 1981).

Pseudotsuga menziesii/Calamagrostis rubescens h.t. (*PSME/CARU;* Douglas-fir/pinegrass)



Distribution.—*PSME/CARU* is a major h.t. throughout much of the study area but is very scarce along the eastern periphery, especially in the Wind River Range. It is also widespread in central Idaho and parts of Montana. *PSME/CARU* usually occupies upper slopes and ridges from 1 829 to 2 469 m (6,000 to 8,100 feet) where various cool, dry aspects have gentle to moderate relief. It normally occurs at the middle to upper elevations of the *Pseudotsuga* series.

Vegetation.—*Pinus contorta* may dominate some seral stands and *P. flexilis* may appear in small amounts. Occasionally *Populus tremuloides* will dominate early seral stands. Otherwise *Pseudotsuga* is the only conifer adapted to the site. Undergrowths vary between the phases listed below.

Pachistima myrsinites (*PAMY*) phase.—This minor phase occurs in southeastern Idaho and adjacent Wyoming where it ranges from about 1 829 to 2 347 m (6,000 to 7,700 feet). A layer of *Pachistima* overtops the *Calamagrostis* and creates a characteristic feature of this phase (fig. 6). *Berberis repens, Prunus virginiana* and *Symphoricarpos oreophilus* are usually present.

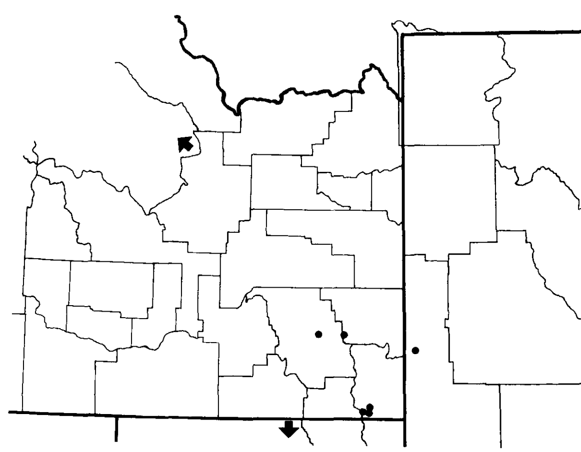
Calamagrostis rubescens (*CARU*) phase.—This is the common phase of the *PSME/CARU* h.t. In the study area it occurs from about 1 829 to 2 469 m (6,000 to 8,100 feet). A low, dense layer of *Calamagrostis* usually dominates the undergrowth (fig. 7). Shrubs and forbs are normally sparse in old, undisturbed stands but in some areas *Symphoricarpos oreophilus* is well represented. Sometimes the *Symphoricarpos* indicates rocky slopes with inherently low tree stockability, but in other areas the *Symphoricarpos* merely invades openings following disturbance of the undergrowth.

Soils.—Soil parent materials were mainly limestone, sandstone, and shale. One site was on rhyolite. Calcareous substrates were common in the *PAMY* phase as opposed to the *CARU* phase. Soil pH ranged from 4.7 to 7.0 and averaged 6.0. Areas of bare soil and rock were usually nil. Average litter depths on a site reached 9.5 cm (3.7 in.) but were usually around 2–3 cm (0.8–1.2 in).

Productivity/Management .—Timber productivity ranges from low to moderate (appendix E–2). Forage production will vary inversely with amount of overstory. When the overstory is reduced, *Calamagrostis* can rapidly develop a thick sod that often requires scarification for successful conifer regeneration. When present, *Pinus contorta* can be regenerated in openings that receive full sunlight provided the site is adequately treated and protected from grazing animals. Lotan and Perry (1977) suggest possible seed: seedling survival ratios for *Pinus contorta* following various site treatments. When *Pseudotsuga* is the only conifer adapted to the site, the seedlings often require protection from wind and sun. In the *CARU* phase, various amounts of *Symphoricarpos oreophilus, Amelanchier,* and *Prunus* may appear in early seral stages but burned areas often return directly to an undergrowth of *Calamagrostis* and *Carex geyeri.*

Other Studies.—The *PSME/CARU* h.t. was previously described in our area by Cooper (1975) and Henderson and others (1976 unpubl.). It was also noted in Montana (Pfister and others 1977) and central Idaho (Steele and others 1981).

Pseudotsuga menziesii/Cercocarpus ledifolius h.t. (*PSME/CELE;* Douglas-fir/curl-leaf mountain-mahogany)



Distribution.—This minor h.t. occurs mainly in the southeastern Idaho portion of the study area but also exists in northern Utah and east-central Idaho. It occurs from 1 890 to 2 255 m (6,200 to 7,400 feet) on a variety of slopes and aspects at or near lower timberline and often borders a *Cercocarpus* shrub community on drier sites. At its moist extreme, it merges with *Pseudotsuga* h.t.'s having denser tree canopies.

Figure 6.—*Pseudotsuga menziesii/Calamagrostis rubescens* h.t., *Pachistima* phase on a north slope in Montpelier Canyon just east of Montpelier, Idaho (2 060 m, 6,760 feet). Pole size *Pinus contorta* and scattered large *Pseudotsuga* dominate the site. *Pachistima* and *Calamagrostis* are the predominate undergrowth species.

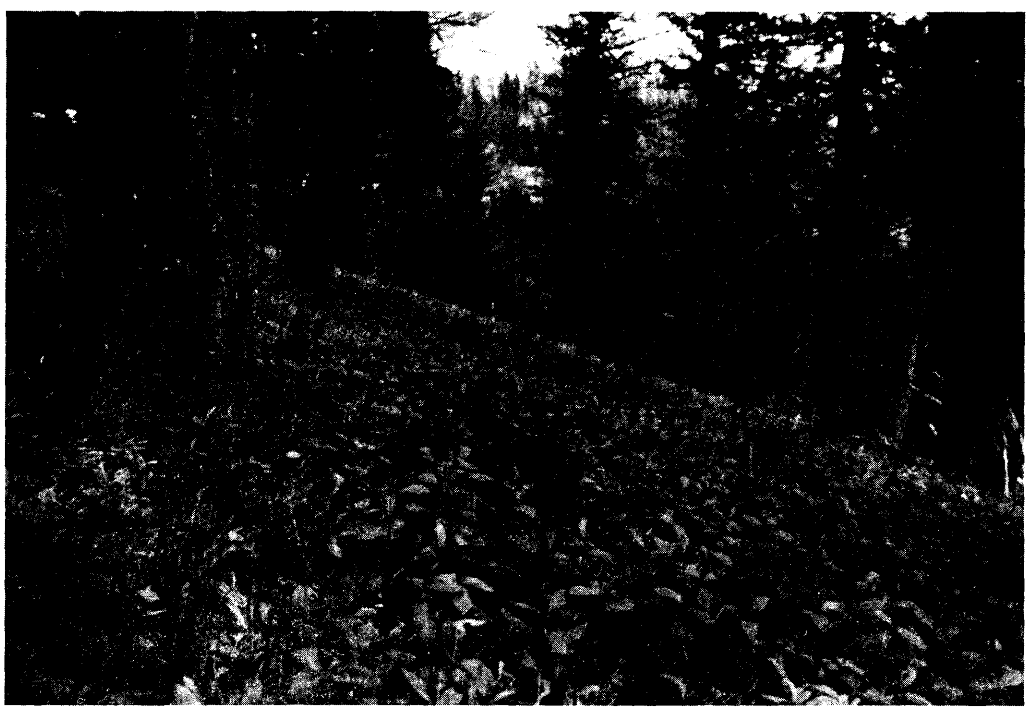


Figure 7.—*Pseudotsuga menziesii/Calamagrostis rubescens* h.t., *Calamagrostis* phase on a steep east slope overlooking the Snake River east of Alpine, Wyo. (1 829 m, 6,000 feet). All-age *Pseudotsuga*, and some *Pinus contorta*, dominate a sward of *Calamagrostis rubescens*. An unusually high coverage of *Aster conspicuus* complements the herbaceous layer on this particular site.

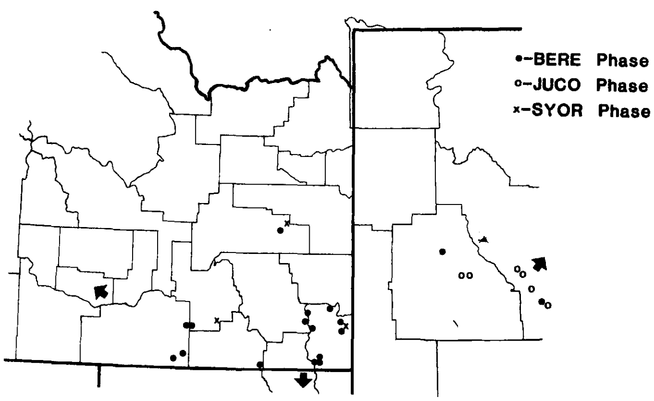
Vegetation.—Trees are often widely scattered. *Pseudotsuga* is usually the only tree present but *Juniperus scopulorum* and small amounts of *Pinus flexilis* may occur. A dense layer of *Cercocarpus* dominates the tree interspaces. Either *Symphoricarpos oreophilus* or *Agropyron spicatum* may form a subordinate layer.

Soils.—Soil parent materials were mainly sandstone and limestone. The pH ranged from 6.8 to 7.5 and averaged 7.2. Coverage of bare rock reached 20 percent on some sites; areas of bare soil reached 5 percent. Average litter depth per site reached 7 cm (2.8 in).

Productivity/Management.—Timber productivity potential is low to very low (appendix E-2), due to low basal areas (stockability limitations) and low site index. Tree regeneration is sporadic. Domestic livestock find sparse forage here, perhaps because of the dense layer of shrubs. In many areas, the *Cercocarpus* provides important food and cover for big game.

Other Studies.—The *PSME/CELE* h.t. was previously recorded in southeastern Idaho (Henderson and others 1976 unpubl.) and in east-central Idaho (Steele and others 1981). It has not been described in other adjacent areas.

Pseudotsuga menziesii/Berberis repens h.t. (*PSME/BERE;* Douglas-fir/Oregon grape)



Distribution.—*PSME/BERE* is a major h.t. in southeastern Idaho and adjacent Utah. It also occurs in extreme south-central Idaho and appears sporadically in the Wind River and Bighorn Mountains of Wyoming. It ranges from 1 737 to 2 591 m (5,700 to 8,500 feet) and occupies a variety of aspects at low to mid-elevations of the forested zone. Adjacent drier sites are generally a *PSME/SYOR* or non-forest h.t.

Vegetation.—*Populus tremuloides, Pinus contorta*, and *Pinus flexilis* are common seral species that vary in abundance according to the phases noted below. When present, these species usually codominate with *Pseudotsuga* in seral stands, but in many areas *Pseudotsuga* is the only tree capable of occupying the site. *Berberis repens* and in some areas *Pachistima myrsinites* form a conspicuous layer in old-growth stands. *Prunus virginiana* and *Symphoricarpos oreophilus* often dominate the undergrowth of seral stands. *Smilacina racemosa* and *Arnica cordifolia* are the most common forbs.

Carex geyeri (*CAGE*) phase.—This incidental phase appears mainly in central Idaho and also in the Uinta Mountains. It was noted locally in our study area at about 2 195 m (7 200 feet) along the western flank of the Teton Range. Here *Pinus contorta* is a minor seral species and *Carex geyeri* forms a prominent layer in the undergrowth (fig. 8).

Juniperus communis (*JUCO*) phase.—The *JUCO* phase occurs mainly in the Bighorn Mountains to the east of our study area (fig. 9). It also occurs locally in the Wind River Range from about 2 347 to 2 591 m (7,700 to 8,500 feet). In this area it appears on northerly aspects having gentle to moderately steep slopes. *Populus tremuloides* and *Pinus contorta* may dominate seral stands and *Pinus flexilis* is often present. Usually *Juniperus communis* is well represented in the undergrowth.

Symphoricarpos oreophilus (*SYOR*) phase.—This phase appears sporadically in southeastern Idaho and along the southern periphery of central Idaho. In the study area it was found on southerly aspects from about 2 012 to 2 255 m (6,600 to 7,400 feet). The *SYOR* phase usually borders nonforest communities that contain *Symphoricarpos oreophilus*. Small amounts of *Pinus flexilis* and *Juniperus scopulorum* may occur, but usually *Pseudotsuga* is the only tree present. *Prunus, Amelanchier*, and *Artemisia* often accompany the *Symphoricarpos*. Trees are widely spaced so that even in old-growth stands these shrubs are never shaded out (fig. 10).

Berberis repens (*BERE*) phase.—This is the most common phase in the study area. It generally occurs on northerly aspects from 1 737 to 2 438 m (5,700 to 8,000 feet). A few seral stands may be dominated by *Populus tremuloides* or *Pinus contorta*, and *Pinus flexilis* may be present. In older stands the *Pseudotsuga* can develop a dense canopy that suppresses the taller shrubs and leaves *Berberis* or *Pachistima* to dominate the undergrowth (fig. 11).

Soils.—Soil parent materials were mainly sandstone or limestone in all phases. In the *BERE* phase, soil pH ranged from 6.1 to 7.7 and averaged 6.5. In the *JUCO* phase, it averaged 6.6 (6.2 to 7.2). Coverages of bare rock and bare soil seldom exceeded 3 percent. Average litter depth on a site reached 10 cm (3.9 in). Other soils data are lacking.

Productivity/Management.—Timber productivity appears moderate to high in the *BERE* phase (appendix E-2) and is probably less in the *JUCO* phase. The *SYOR* phase has little timber potential. *Pseudotsuga* seedlings may require openings small enough to receive protection from wind and sun. Cattle may use these sites for rest and shelter, especially when grazing areas are nearby. Light use by big game was noted in much of this h.t. and the *SYOR* phase often receives moderate big game use.

Figure 8.—*Pseudotsuga menziesii/Berberis repens* h.t., *Carex geyeri* phase in the Badger Creek drainage, west slope of the Teton Range (2 195 m, 7,200 feet). All-age *Pseudotsuga* and minor amounts of *Pinus contorta* dominate this gentle southeast slope. *Pachistima, Berberis, Amelanchier*, and *Prunus* are the prominent shrubs over a dense layer of *Carex geyeri*.

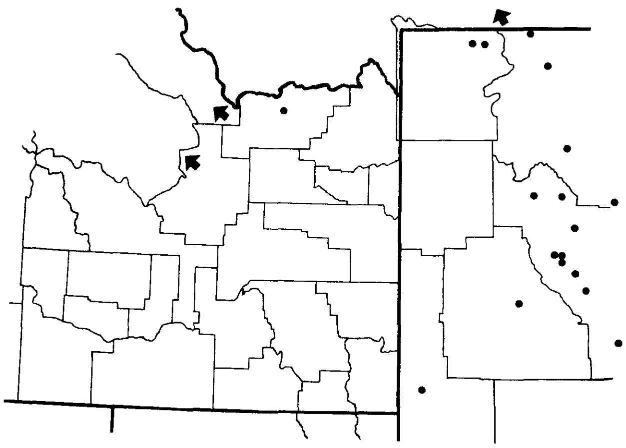
Figure 9.—*Pseudotsuga menziesii/Berberis repens* h.t., *Juniperus communis* phase on a gentle south slope in the Bighorn Mountains east of Lovell, Wyo. (2 225 m, 7,300 feet). An all-age stand of *Pseudotsuga* dominates the site. *Berberis* and *Juniperus* are well represented in an otherwise depauperate undergrowth.

Figure 10.—*Pseudotsuga menziesii/Berberis repens* h.t., *Symphoricarpos oreophilus* phase on a steep southwest slope in the Deep Creek Mountains southwest of Pocatello, Idaho (2 027 m, 6,650 feet). Widely spaced *Pseudotsuga* dominate a shrub layer composed mainly of *Symphoricarpos, Berberis, Amelanchier*, and *Artemisia*.

Figure 11.—*Pseudotsuga menziesii/Berberis repens* h.t., *Berberis* phase in the Left Fork drainage just east of Montpelier, Idaho (2 103 m, 6,900 feet). A pure stand of *Pseudotsuga* dominates this north slope. *Berberis* and *Pachistima* appear throughout the undergrowth. *Arnica cordifolia* is the dominant forb.

Other Studies.—This h.t. was first described in the southern Sawtooth National Forest (Steele and others 1974 unpubl.). Since then it has been described in central Idaho (Steele and others 1981), northern Utah and adjacent Idaho (Henderson and others 1976 unpubl., 1977 unpubl.) and north-central Wyoming (Hoffman and Alexander 1976).

Pseudotsuga menziesii/Juniperus communis h.t. (*PSME/JUCO;* Douglas-fir/common juniper)



Distribution.—*PSME/JUCO* occupies extensive areas on the east slope of the Wind River and Absaroka Ranges. It is also common in east-central Idaho and adjacent Montana. In our study area this h.t. ranges from about 1 981 to 2 835 m (6,500 to 9,300 feet) and normally occupies exposed rocky slopes at low to mid-elevations of the forest zone.

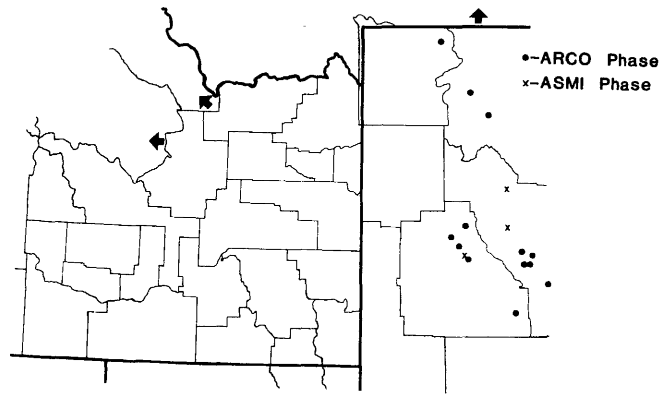
Vegetation.—*Pinus flexilis* and occasionally *P. contorta* are common seral species but they seldom dominate the site. Normally, *Pseudotsuga* dominates both seral and old-growth stands. *Juniperus communis* usually forms large patches in unburned undergrowths of older stands (fig. 12). *Symphoricarpos oreophilus* is often present and *Shepherdia canadensis* usually occurs in younger stands. *Arnica cordifolia* or *Astragalus miser* usually dominates the forb layer.

Soils.—Soil parent materials were mainly limestone or sandstone but also included shale, quartzite, granitics, and volcanics. The pH ranged from 5.6 to 7.4 and averaged 6.6. High coverages of bare rock were common and reached 50 percent. Areas of bare soil were normally less than 1 percent. Average litter depth seldom exceeded 6 cm (2.4 in.).

Productivity/Management.—Timber productivity potential is low (appendix E-2). When present, *Pinus contorta* may be near its warm, dry limits and may not respond well to management. Regeneration of *Pseudotsuga* can be sporadic and any timber harvest should be guided by the patterns of regeneration observed in the stand. Most of these sites have little potential for livestock but often receive summer use by big game.

Other Studies.—The *PSME/JUCO* h.t. was previously described in east-central Idaho (Steele and others 1981) and in Montana (Pfister and others 1977). It has not been noted in other studies of adjacent areas.

Pseudotsuga menziesii/Arnica cordifolia h.t. (*PSME/ARCO;* Douglas-fir/heartleaf arnica)



Distribution.—This major h.t. occurs mainly in the Wind River Range and the east flank of the Absaroka Range. It is also common in east-central Idaho and adjacent Montana. In our area it ranges from about 2 103 to 2 896 m (6,900 to 9,500 feet) and occupies a variety of dry aspects at low to mid-elevations of the forest zone.

Vegetation.—Usually *Pseudotsuga* and small amounts of *Pinus flexilis* are the only trees present but *Pinus contorta* or *Juniperus scopulorum* may appear on some sites. *Symphoricarpos oreophilus, Poa nervosa*, and *Festuca idahoensis* are common members of a generally depauperate undergrowth. *Arnica cordifolia* or *Astragalus miser* are the dominant forbs and indicate phasal differences as noted below.

Astragalus miser (*ASMI*) phase.—This phase occurs locally from about 2 499 to 2 896 m (8,200 to 9,500 feet) in the Wind River Mountains. It also occurs in the Lemhi and Beaverhead Ranges of east-central Idaho. *Pinus flexilis* is usually present and *Astragalus miser* dominates the undergrowth. The forb layer here is usually even more depauperate than in the *ARCO* phase.

Arnica cordifolia (*ARCO*) phase.—The *ARCO* phase occurs from 2 103 to 2 789 m (6,900 to 9,150 feet) and is widespread geographically. This phase occasionally supports *Pinus contorta*, otherwise *P. flexilis* and *Pseudotsuga* are the only trees present. Sometimes *Astragalus miser* will codominate with the *Arnica* and may denote areas transitional to the *ASMI* phase.

Soils.—Soil parent materials were mainly sandstone or limestone but also included granitics, gneiss, and volcanics. The pH ranged from 4.9 to 7.5 and averaged 6.6. Coverages of bare rock varied but were usually less than 3

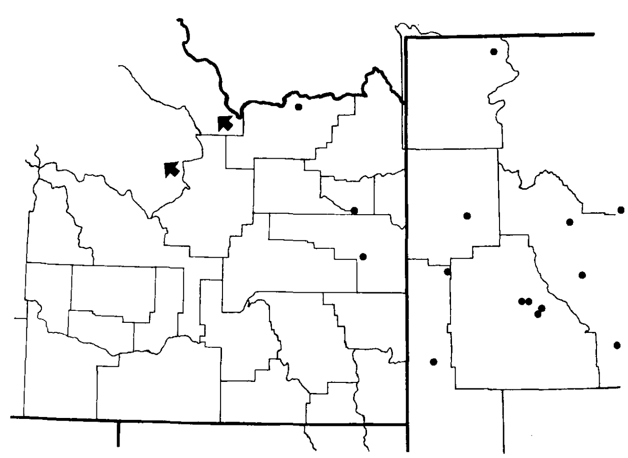
Figure 12.—*Pseudotsuga menziesii/Juniperus communis* h.t. in the West Branch Hams Fork drainage due east of Border, Wyo. (2 560 m, 8,400 feet). This southern outlier of the h.t. occurs on a steep westerly slope and is dominated by an exceptionally open stand of *Pseudotsuga*. Large patches of *Juniperus communis* dominate the undergrowth.

percent. Areas of bare soil were usually less than 1 percent. Average litter depths on a site seldom exceeded 4 cm (1.6 in).

Productivity/Management.—Tree regeneration is often infrequent and spotty and may not improve with management on these dry sites. Some seral stands in early pole-sized stages may appear overstocked, especially in the *ARCO* phase, but tree growth potential is low (appendix E-2). Early seral stands provide some forage for domestic livestock; animals attracted to these sites may damage tree seedlings. More mature stands offer little forage but provide shelter for animals that feed in nearby grasslands. In some areas these stands also provide important cover for deer and elk.

Other Studies.—The *PSME/ARCO* h.t. was previously described in central Idaho (Steele and others 1981) and Montana (Pfister and others 1977).

Pseudotsuga menziesii/Symphoricarpos oreophilus h.t. (*PSME/SYOR;* Douglas-fir/mountain snowberry)



Distribution.—*PSME/SYOR* is a minor h.t. that occurs mainly in the Wind River Range and in east-central Idaho. It occurs from about 2 012 to 2 530 m (6,600 to 8,300 feet) and typically represents a lower timberline condition where the timberline is relatively high. It can occupy a variety of slopes and aspects but southerly aspects are most common.

Vegetation.-Occasionally *Pinus flexilis* or *Juniperus scopulorum* are present but usually *Pseudotsuga* is the only tree on the site. The trees are usually widely spaced. *Symphoricarpos oreophilus* normally dominates a shrub layer that includes *Artemisia tridentata* and *Ribes cereum*. Generally forbs are sparse and *Agropyron spicatum* dominates the shrub interspaces. Adjacent drier sites usually support steppe or mountain shrub communities dominated by *Symphoricarpos oreophilus, Artemisia tridentata*, and *Festuca idahoensis*. The *PSME/ARCO* or *PSME/JUCO* h.t.s are most common on adjacent moist sites.

Soils.—Soil parent materials included calcareous shale, sandstone, granitics and limestone. The pH ranged from 5.4 to 7.6 and averaged 6.4. Coverage of bare rock varied considerably and reached 40 percent. Areas of bare soil reached 5 percent. Average litter depth on a site seldom exceeded 5 cm (2 in).

Productivity/Management.—Timber productivity is low to very low (appendix E-2) and trees regenerate sporadically in this h.t. Success at artificial regeneration is apt to be low since these sites have inherent stockability limitations. The abundant shrubs and grasses attract both wild and domestic herbivores and the trees can shelter animals that use adjacent rangelands.

Other Studies.—The *PSME/SYOR* h.t. was previously described in central Idaho (Steele and others 1981) and its presence is noted in Montana (Pfister and others 1977). Reed (1969) described a *PSME/SYOR* h.t. in Wyoming that was much broader and included our *PSME/ARCO* h.t. and a small amount of the *PSME/BERE* and *PIFL/HEKI* h.t.'s.

Pseudotsuga menziesii/Festuca idahoensis h.t. (*PSME/FEID;* Douglas-fir/Idaho fescue)

Distribution.—*PSME/FEID* is an incidental h.t. in the study area. It was found in small amounts along the North Fork of the Shoshone River where it occupies northerly aspects at about 1 829 m (6 000 feet). It represents a lower timberline condition and borders *Artemisia tridentata/Festuca idahoensis* communities.

Vegetation.—Open stands of *Pseudotsuga* dominate the site. *Symphoricarpos oreophilus* and *Ribes cereum* are sparse but occur throughout the stand. *Festuca idahoensis* dominates the undergrowth and is often accompanied by *Elymus cinereus* and *Hesperochloa kingii*.

Productivity/Management.—Timber productivity typically is low to very low and tree regeneration is sporadic. In some areas forage values exceed those of timber and the sites are often important big game winter range.

Other Studies.—*PSME/FEID* is more common in Montana (Pfister and others 1977) and in central Idaho (Steele and others 1981). Both of these studies describe the *Festuca idahoensis* phase, which is the only phase known from our study area.

Picea engelmannii Series

Distribution.—As more areas of the Intermountain West are ecologically inventoried, the community ecology and distribution pattern of *Picea engelmannii* appears increasingly complex. Its status in northwestern Montana and northern Idaho is generally that of a minor seral component of the *Abies grandis, Thuja*, and *Tsuga* series. Beyond the eastern range of these three, *P. engelmannii* is of minor to moderate seral importance in the *Abies lasiocarpa* series. In our study area, as in Montana (Pfister and others 1977) and central Idaho (Steele and others 1981), *P. engelmannii* occurs as a climax codominant or dominant on the wettest habitat types, where it appears more successful than *A. lasiocarpa*. The importance of *P. engelmannii* generally increases and that of *Abies lasiocarpa* decreases, progressing away from the Pacific maritime influence. This increase in *Picea* importance becomes conspicuous in the highest elevation forests along the eastern periphery of the study area where most frequently *Picea*, rather than *Abies*, joins *Pinus albicaulis* as a codominant on the more severe sites. The relative abundance of *Picea* to *Abies* spp. with increasing elevation is most strongly expressed in the Southwest; this trend has been described in Colorado (Wardle 1968; Pearson 1931) and New Mexico and Arizona (Pearson 1931; Moir and Ludwig 1979; Layser and Schubert 1979). In parts of the study area, *Picea* also surpasses the lower limits of *Abies* and either interfingers with the *Pseudotsuga* series or forms the lower timberline.

Hybridization of *P. glauca* and *P. engelmannii* is widespread across Montana and extends into northeastern Yellowstone National Park and southward in the Absaroka Range. Pfister and others (1977) and Daubenmire (1974) have hypothesized that through hybridization introgression of *P. glauca* genes into *P. engelmannii* populations has allowed *Picea* to extend downslope below the limits of *A. lasiocarpa*. Such an extension for *P. engelmannii* x *P. glauca* was noted within the study area on calcareous parent materials.

Hybridization of *P. pungens* and *P. engelmannii* has been suggested (Porter 1957; Weber 1976) but Daubenmire (1972) analyzed *Picea* populations over a wide range and presented evidence that this speculation is unfounded. A more detailed study in the Colorado Front Range (Mitton and Andalora 1981) also found no hybrids. *Picea pungens* occurs in the study area at the lower forested elevations along the Hoback, Snake, and Buffalo Fork Rivers and on the western flank of the Wind River Range. It occurs mainly as a component of minor riparian types mixed with *Populus* spp., but occasionally scattered individuals appear on moist uplands. *P. pungens* can also occur as the overstory dominant of small wet areas. In the central Rocky Mountains and in the Southwest, a number of *P. pungens* habitat types have been classified (Henderson and others 1977, unpubl.; Moir and Ludwig 1979) on both upland and riparian situations. No *P. pungens* habitat types could be recognized in our study area. Where *P. pungens* and *P. engelmannii* grow on the same site, *P. pungens* appears seral to *P. engelmannii.*

East of the Continental Divide there are large areas where *Abies* is absent and its place taken by *Picea engelmannii* or *Pinus contorta*. A strong *Picea* component was also noted on the east slope of the Salt River Range. Some of these occurrences of pure *Picea* populations might be explained by the presence of calcareous substrates, on which *Picea* can readily establish and *A. lasiocarpa* and *P. contorta* rarely occur. Other *Picea* populations in the absence of *Abies* occur as pockets, but sometimes extend hundreds of acres on Absaroka volcanics (primarily andesite) and Wind River granitics. In the Owl Creek Range, where intensive sampling was conducted, the northwestern portion supports virtually no *Abies*; all sites more moist than the *Pseudotsuga* series and warmer or moister than the *Pinus albicaulis* series belong in the *Picea engelmannii* series. Farther to the southeast in the Owl Creek Range (farther from a maritime climate) on comparable substrates, *Abies* codominates with *Picea*. This pattern is an apparent local contradiction to the usually inferred affinity of *Abies* for more maritime regimes (Pfister and others 1977).

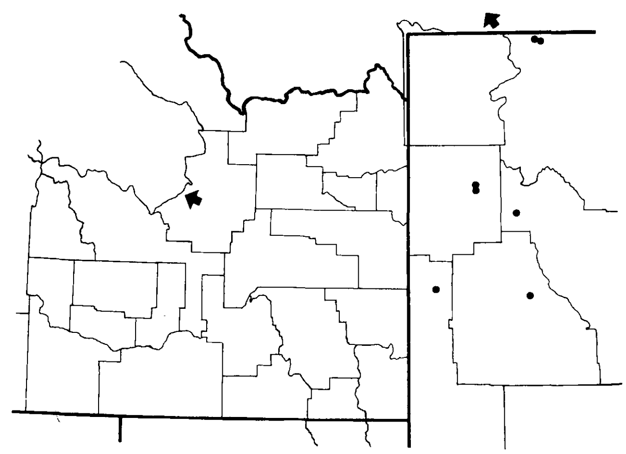
Vegetation.—Seral stand composition is dependent on habitat type and parent material. On the wettest sites, *Picea* is often the sole dominant even though *Abies* may establish on elevated microsites. *Pinus contorta* and *Pseudotsuga* are important seral components on moist to well-drained sites. *P. contorta* apparently does not grow on calcareous substrates (in the absence of high precipitation and moist microsites), but *Pseudotsuga* often grows well on these sites. *Populus tremuloides* is relatively uncommon in the *PIEN* series and, for the study area as a whole, pure or mixed stands of *P. tremuloides* are most limited where *PIEN* habitat types are the most extensive. On the driest sites, *Pinus flexilis* is usually a minor seral component of *PIEN* habitat types but may be locally important on calcareous substrates where its upper elevational range is much extended. On dry sites at high elevations, *P. albicaulis* can become the major seral species on noncalcareous substrates.

The undergrowths in this series vary such that habitat types representing the two ends of the moisture continuum have virtually no species in common except *Picea*. Many undergrowths strongly resemble similar habitat types of the *Abies* and *Pseudotsuga* series. In some instances the only floristic difference between habitat types is the inferred climax-dominant tree species.

Fire.—Much of this series shows little evidence of fire, which is partly due to the high proportion of wet to moist habitat types. The high-elevation types (*PIEN/VASC, PIEN/HYRE*) are also less frequently burned than lower elevation sites because they occur as relatively small, often discontinuous areas, with low fuel loadings. The low-elevation types, *PIEN/ARCO* and *PIEN/JUCO*, have the greatest occurrence of seral tree species and generally have the highest fire frequencies within the series.

Productivity/Management.—In Wyoming, the *Picea engelmannii* series apparently spans a wider spectrum of sites, especially dry sites, than in Montana or Idaho. These sites span a wide elevation range from low elevation stream bottoms to upper timberline. Both the wettest and driest types represent extreme environmental conditions, which are reflected in the low yield capabilities of these sites (appendix E-2). Many of the high-elevation sites are of marginal productivity and still inaccessible enough to preclude timber harvest. Some sites with high water tables are relatively productive but are easily degraded by timber harvesting. The wet to moist types constitute important habitat for moose, elk, deer, and bear.

Picea engelmannii/Equisetum arvense h.t. (*PIEN/EQAR*; spruce/common horsetail)



Distribution.—*PIEN/EQAR* is a minor h.t. that occurs sporadically in small patches from the Greys River and Wind River Range northward into Montana and east-central Idaho. It ranges from 1 890 to 2 652 m (6,200 to 8,700 feet) and occupies the saturated soils of stream terraces, benches, or seeps (fig. 13). This h.t. was most frequently noted to border *PIEN/GATR, ABLA/STAM* or *ABLA/VAGL* h.t.'s on upland sites with a relatively sharp ecotone between types.

Vegetation.—*Picea engelmannii* is usually the dominant tree of any successional stage on these sites, but one low-elevation site was dominated by *P. pungens*. *Pinus contorta* is a minor seral species, and small numbers of *Abies lasiocarpa* often appear in the stand but are usually restricted to raised microsites. The *PIEN/EQAR* sites in our study differ from those in Montana in that they are generally above the elevational limits of *Populus trichocarpa* and *P. angustifolia* and south of the distributional limits of *Betula papyrifera*.

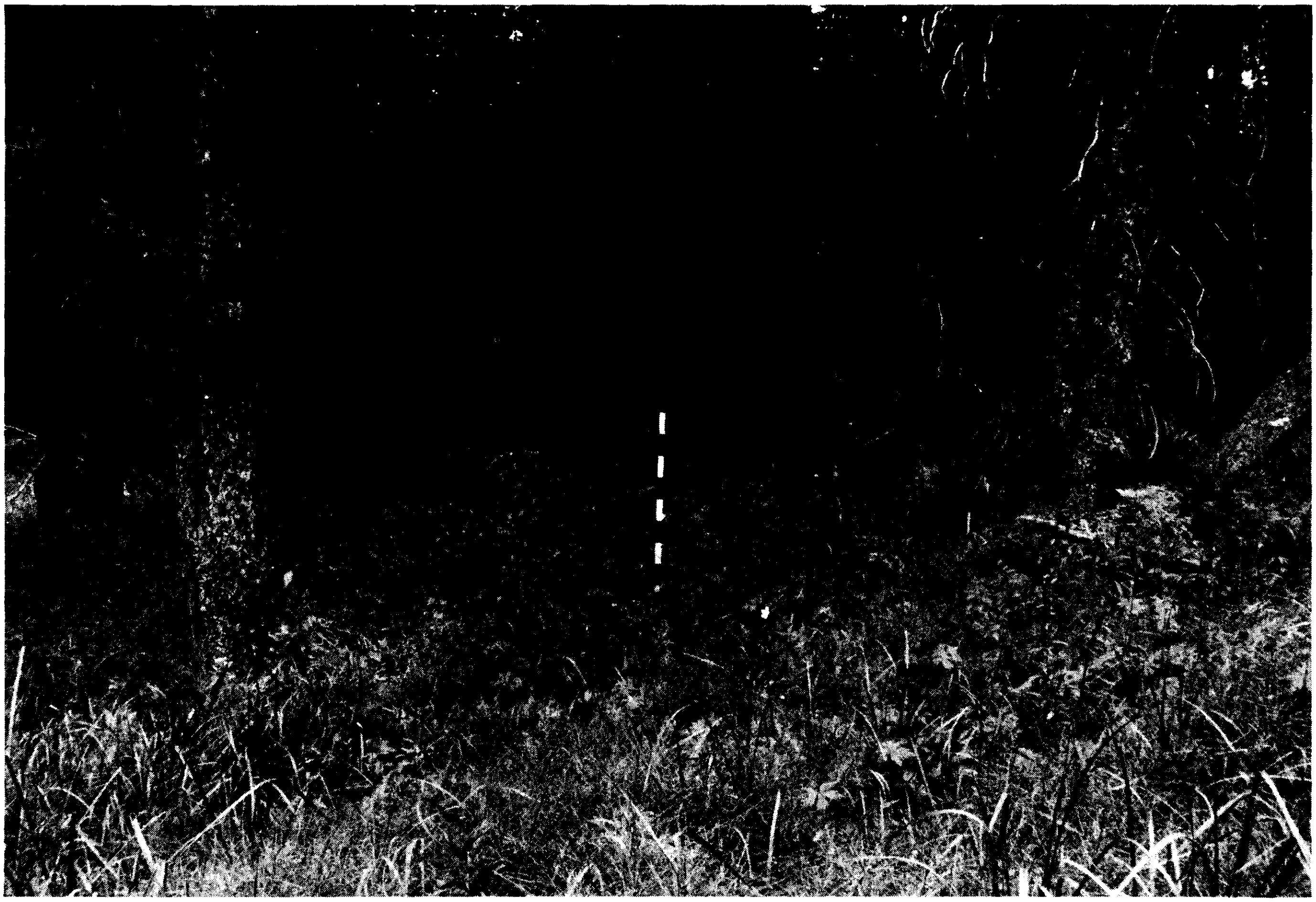


Figure 13.—*Picea engelmannii/Equisetum arvensis* h.t. on a broad stream terrace in the southern end of the Beartooth Mountains (2 130 m, 6,986 feet). Old *Pinus contorta* and all-age *Picea* dominate the site. The abundance of *Equisetum* indicates a substrate that is wet much of the year.

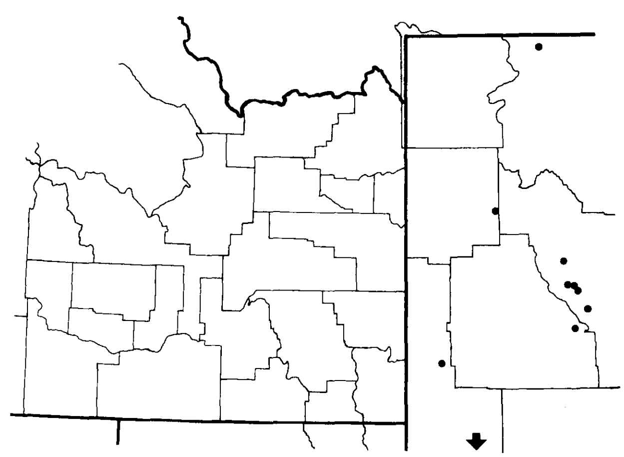
The undergrowth is dominated by *Equisetum arvense* and a rich assortment of wet site forbs, such as *Streptopus amplexifolius, Parnassia fimbriata*, and *Senecio triangularis*, and the graminoids *Carex* spp., *Juncus* spp. and *Luzula parviflora*. The shrub component is relatively depauperate. The sometimes extreme micro-relief generated by root crown hummocks and windthrow mounds accounts for the high species richness.

Soils.—Owing to the topographic position of these sites, soils were largely alluvial, with a mixture of parent materials. Most sites had a layer of mor humus, in some cases to 28 cm (11 in) thick. The pH averaged 7.1 and ranged from 6.9 to 7.2.

Productivity/Management.—Timber productivity is moderate (appendix E-2) but of little consequence because of the fragility of these ecosystems. The trees are extremely susceptible to windthrow and soil loss may follow all forms of timber harvesting. Even if logged when the ground is frozen to reduce equipment impacts, evidence indicates that water tables will rise, creating additional problems in site management. In some areas, moose, elk, and bear use these sites for feed and wallows.

Other Studies.—Cooper (1975) previously described this h.t. in part of the study area. It has also been described for Montana (Pfister and others 1977) and central Idaho (Steele and others 1981).

Picea engelmannii/Caltha leptosepala h.t. (*PIEN/CALE*; spruce/marsh marigold)



Distribution.—This minor h.t. occurs mainly east of the Continental Divide from the Beartooth and Absaroka Ranges southward to the Wind River Range. It also occurs in the Bighorn Mountains of Wyoming and the Uinta Range of Utah. *PIEN/CALE* occupies limited areas along streambanks and terraces and ranges from about 2 499 to 2 896 m (8,200 to 9,500 feet). It often forms an abrupt ecotone with *PIEN/VASC* or *ABLA/VASC* h.t.'s.

Vegetation.—*Picea engelmannii* dominates both seral and climax communities. *Pinus contorta* and *P. albicaulis* are minor seral components. *Abies lasiocarpa* may achieve co-dominant status predominantly on raised microsites, but the specimens seldom outcompete *Picea*.

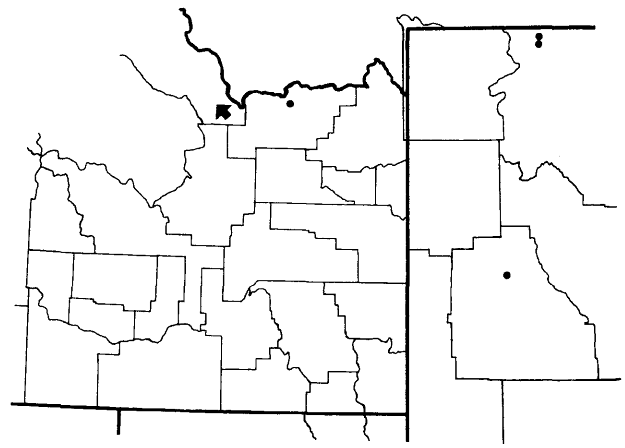
The undergrowth is characterized by either of the diagnostic species, *Trollius laxus* or *Caltha leptosepala*, and a rich complement of wet-site forbs such as *Mitella pentandra, Senecio triangularis, Saxifraga arguta, Veronica* spp. and *Parnassia fimbriata. Carex* spp., *Juncus* spp., *Calamagrostis canadensis*, and *Luzula parviflora* are the graminoids of highest constancy but normally they have low coverages. As in the *PIEN/EQAR* h.t., the shrub layer is relatively simple, but *Vaccinium scoparium* occasionally achieves high coverages on hummocks. Other ericaceous dwarf shrubs typical of bog sites, such as *Kalmia polifolia, Phyllodoce empetriformis*, and *Vaccinium occidentale* attain modest coverages.

Soils.—Parent materials were all noncalcareous and were primarily granitic alluvium. In rare instances sites were found on limestone-sandstone contact zones. The alluvial nature of these soils is reflected in the low coarse-fraction content, which averaged 11 percent. Soils are nearly perpetually saturated; only the raised microsites dry to any degree. Most sites have a deep deposit of organic muck and are characterized by gleization of lower horizons and moderately acidic pH values (5.3 to 6.1, average of 5.7).

Productivity/Management.—Timber productivity is very low to moderate, (appendix E-2). This productivity range is the lowest of the moist to wet h.t.'s., possibly because *PIEN/CALE* occurs at relatively high elevations (colder sites). Because there are no major seral trees, these sites can be expected to produce mostly *Picea* and lesser amounts of *Pinus contorta*. Sites logged in the Wind River Range more than 50 years ago reverted to swamps dominated by ericaceous shrubs and *Salix* spp. *Picea* and *Pinus contorta* were slow to reestablish. Though these early seral sites appear to offer excellent forage, little evidence of livestock use was noted; however, elk and moose may use these sites considerably during the summer. Road construction and site preparation are extremely difficult because of high water tables. If the site is logged, all trees of a given height should be harvested to prevent loss to windthrow of the residual stems projecting above the main canopy height.

Other Studies.—Henderson and others (1977 unpubl.) describe this h.t. in the Uinta Mountains of Utah. A similar *Abies lasiocarpa/Caltha biflora* h.t. occurs in central Idaho (Steele and others 1981).

Picea engelmannii/Carex disperma h.t. (*PIEN/CADI*; spruce/softleaved sedge)



Distribution.—This minor h.t. occurs mainly in east-central Idaho and extends sporadically eastward into the Centennial Mountains. It also occurs locally in the Beartooth, Absaroka, and Wind River Ranges. *PIEN/CADI* occurs from about 2 195 to 2 408 m (7,200 to 7,900 feet) and usually occupies stream terraces near the lower limits of *Abies lasiocarpa*.

Vegetation.—Although one may expect to find *Pinus contorta* as a seral dominant on these sites it was not found as such in the study area. Usually, *Picea engelmannii* is the dominant tree (one stand in the Wind River Range was dominated by *Picea pungens*). Occasionally a few *Abies lasiocarpa* appear on raised microsites. Undisturbed undergrowths, rare due to trampling by cattle, are dominated by a layer of *Carex disperma*. A diverse assemblage of wet-site forbs also occurs throughout the stand. *PIEN/CADI* appears similar to *PIEN/EQAR* and contains many of the same-wet site herbs and shrubs.

Soils.—Soils are saturated most of the year and support an organic layer that can reach at least 30 cm (11.8 in). Roots are mostly confined to this layer, which is usually considered muck. Other soils data for this h.t. are lacking.

Productivity/Management.—Timber productivity is low to moderate (appendix E-2), and tree seedlings probably require the raised microsites of hummocks and fallen logs for establishment. Partial cutting in old-growth stands may subject remaining large trees to windthrow. Machinery and livestock can easily churn the *Carex* mat and leave the substrate exposed to erosion. The livestock find little forage here but seek these cool, wet sites for resting and watering. Moose, elk, and black bear may use these sites for wallows.

Other Studies.—*PIEN/CADI* is also described in east-central Idaho (Steele and others 1981).

Picea engelmannii/Physocarpus malvaceus h.t. (*PIEN/PHMA*; spruce/ninebark)

Distribution.—This incidental h.t. was found in the Clarks Fork drainage of the Yellowstone River at about 2 195 m (7,200 feet). It occupies northerly aspects on steep to gentle slopes.

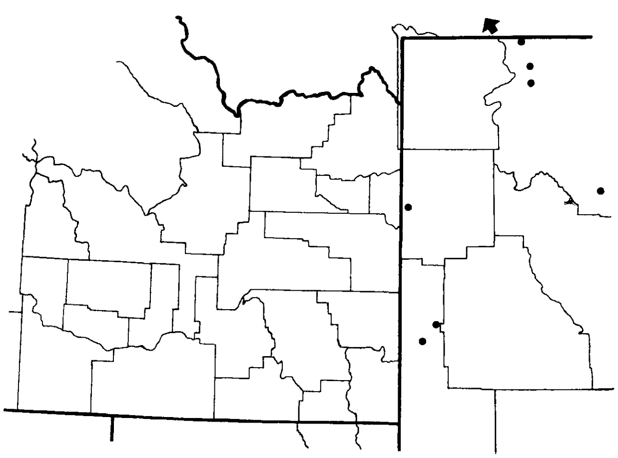
Vegetation.—In older stands, *Picea* dominates the overstory and *Pseudotsuga* is present in lesser amounts. An occasional *Abies* may be present. *Pseudotsuga* tends to dominate seral stands.

Physocarpus malvaceus dominates the undergrowth. *Galium triflorum* is a common, moist-site forb in this h.t. and is often accompanied by *Disporum trachycarpum*, and *Thalictrum* sp.

Productivity/Management.—Data from Pfister and others (1977) suggest that timber productivity is moderate. Domestic livestock appear to make little use of these sites, but deer, elk, and moose may use them for cover. Early seral stages may also provide browse for big game.

Other Studies.—Pfister and others (1977) describe *PIEN/PHMA* as an extensive h.t. in south-central Montana. It has not been noted elsewhere.

Picea engelmannii/Galium triflorum h.t. (*PIEN/GATR*; spruce/sweetscented bedstraw)



Distribution.—This minor h.t. occurs mainly in south-central Montana and extends southward into western Wyoming. Areas too small to sample were also observed in the Wind River Range. These sites typically occur on alluvial terraces or bottomlands between 1 859 to 2 499 m (6,100 and 8,200 feet). Occasionally they are associated with seeps. Adjacent sites are most frequently moist h.t.'s of the *Abies lasiocarpa* series, such as *ABLA/VAGL*, *ABLA/LIBO*, and *ABLA/VASC*.

Vegetation.—Normally *Picea engelmannii* dominates the stand, but in scattered locations in the Wind River Range and along the Greys River, *P. pungens* is sometimes dominant or codominant. Occasionally *Abies lasiocarpa* may achieve a minor foothold, and minor amounts of *Pinus contorta* and *Pseudotsuga* may invade following disturbance.

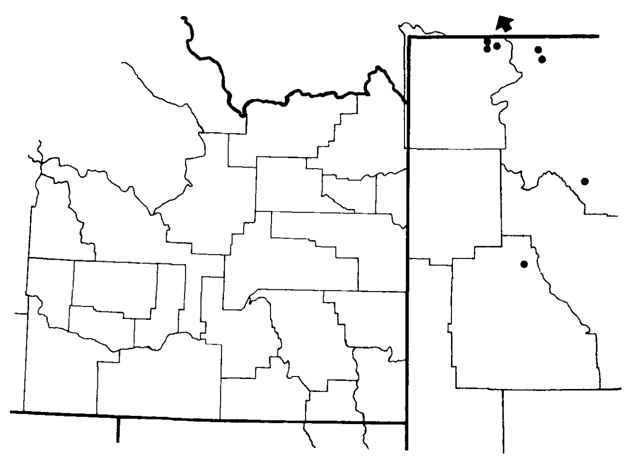
Undergrowths vary considerably as a reflection of site history and adjacent plant communities. *Galium triflorum*, *Actaea rubra*, and *Smilacina stellata* are common throughout the type. *Streptopus amplexifolius*, *Senecio triangularis*, and *Calamagrostis canadensis* may dominate the wetter microsites.

Soils.—Soils were developed chiefly on alluvial deposits of various origins, which include limestones, quartzite, sandstones, and shale. Despite the presence of high water tables most of the year, these sites display generally high pH values, which range from 6.0 to 8.1 (average 7.1). Bare soil and rock are virtually absent but the coarse fraction content is relatively high (25%). Average litter depth can reach 10 cm (3.9 in). Some sites have wet organic layers that can exceed 50 cm (20 in).

Productivity/Management.—Based on limited data, timber productivity ranges from moderate to very high (appendix E-2). *Picea* and sometimes *Pinus contorta* grow well in this h.t., but the streamside locations and high water tables may restrict timber harvest. As a result, preservation of soil and water resources may outweigh other values present. Some sites within Grand Teton and Yellowstone National Parks and the Gros Ventre Mountains were noted to sustain heavy use by moose and elk.

Other Studies.—Cooper previously described part of this h.t. as the *PICEA-ABLA/GATR* h.t. In south-central Montana, Pfister and others (1977) have recognized a *PICEA/GATR* h.t. that differs from that recognized herein only by the greater representation of *P. contorta* and *Pseudotsuga* in seral stands.

Picea engelmannii/Linnaea borealis h.t. (*PIEN/LIBO*; spruce/twinflower)



Distribution.—*PIEN/LIBO* is a minor h.t. from the Wind River Mountains northward into central Montana. Only in the northeastern portion of Yellowstone National Park and contiguous portions of the Shoshone National Forest did it attain an appreciable areal extent. It occurs primarily at moderate elevations of the subalpine zone (1 890 to 2 499 m [6,200 to 8,200 feet]) on steep slopes as well as alluvial terraces and well-drained benches that shed cold air.

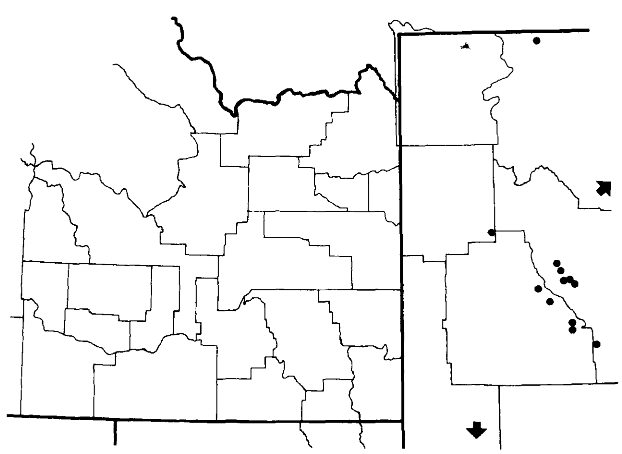
Vegetation.—*Pinus contorta* and *Pseudotsuga* are the most important seral tree species. This is the most moist of the *Picea* h.t.'s in which *Pseudotsuga* is a major seral species. *Picea engelmannii* usually codominates with the seral trees in the later successional stages. *Linnaea borealis* characterizes the undergrowth but may be overtopped by a rich assortment of shrubs, some of which typify drier sites; for example, *Juniperus communis* and *Symphoricarpos albus*.

Soils.—In the northeastern portion of the study area, this type was observed on Absaroka volcanics (chiefly andesite and rhyolite). It was also noted on limestone and granitics. Areas of bare rock and bare soil were usually less than 1 percent. Average litter depth on a site can reach 10 cm (3.9 in).

Productivity/Management.—Timber potentials range from low to high and are mostly moderate (appendix E-2). The gentle terrain generally associated with this habitat type favors intensive timber management. *Picea, Pinus contorta*, and *Pseudotsuga* should regenerate easily on these sites. Single-tree and group-selection cuts will favor *Picea*; larger openings will favor *Pseudotsuga* and *Pinus contorta*. Domestic livestock and big game seldom find much forage on these sites, but big game animals may use these areas for shelter and resting.

Other studies.—Cooper (1975) described a *Picea-Abies/Libo* complex in Yellowstone National Park that included *PIEN/LIBO*. Pfister and others (1977) described a *Picea/Libo* h.t. in Montana.

Picea engelmannii/Vaccinium scoparium h.t. (*PIEN/VASC*; spruce/grouse whortleberry)



Distribution.—In the study area, *PIEN/VASC* was found primarily in the Wind River Range, but it also appears in the Bighorn Mountains of Wyoming and in the Uinta Mountains of Utah. It represents the upper elevations of the *Picea engelmannii* series and ranges from about 2 682 to 3 292 m (8,800 to 10,800 feet). This h.t. is most common on gentle terrain but extends to steep slopes of predominantly northerly exposures. With increasing elevation, *PIEN/VASC* may grade into a *PIAL/VASC* or *PIAL/CARO* h.t. *PIEN/VASC* was conspicuously absent in the Owl Creek Range where it is replaced by *ABLA/VASC* on similar positions and substrates.

Vegetation.—*Pinus contorta* is the important seral tree species at lower elevations, with seral dominance gradually shifting to *P. albicaulis* and *Picea* at higher elevations. Both pines are only slowly replaced by the climax dominant *Picea. Abies* is sometimes present but shows little potential for increasing.

The undergrowth, dominated by *Vaccinium scoparium*, is depauperate but usually includes *Antennaria microphylla, Arnica cordifolia, Lupinus* spp., and *Solidago multiradiata*. The forbs seldom attain high coverages; *Arnica cordifolia* is usually the most prevalent.

Soils.—In the study area, this h.t. was found mainly on granitic or sandstone substrates, but in Utah it has been noted on quartzite (Henderson and others 1977 unpubl.). The pH averaged 5.2 and ranged from 4.8 to 5.5. Bare rock and bare soil did not exceed 5 percent, but granitic outcrops occasionally reached 15 percent in coverage. In several areas where *PIEN/VASC* occurred in a mosaic with drier sites, soil pits revealed a deeper A1 horizon and much greater (twofold to fourfold) depth to regolith for the *PIEN/VASC* h.t. We could not account for the differential soil depths between sites, which may have been due to past erosional patterns.

Productivity/Management.—Timber productivity is low to moderate (appendix E-2) and apparently decreases with increasing elevation. *Pinus contorta* should regenerate well in openings, but cones of many populations are nonserotinous, which may pose problems when attempting to regenerate *P. contorta* in extensive clearcuts. *Picea* regeneration is favored by single-tree and group-selection cuts, which provide protection from dessication. Domestic stock find almost no forage here, but elk and deer use these sites for cover during the summer.

Other Studies.— Reed (1969) originally described this h.t. in the Wind River Range, but he also included stands that contain successful *Abies* reproduction and therefore conform to our *ABLA/VASC* h.t. A similar approach was taken by Hess (1981) in northern Colorado. In the Bighorn Mountains, Hoffman and Alexander (1976) describe a *PIEN/VASC* h.t., part of which occurs at somewhat warmer, lower elevations and contains *Berberis repens* and *Spiraea betulifolia. PIEN/VASC* extends with some floristic modification to the Uinta Mountains of Utah (Pfister 1972a) and the Colorado Front Range, where some mountains support climax *Picea* with *Vaccinium myrtillus* or *V. scoparium* (Peet 1978; Marr 1961). Similar conditions also appear in New Mexico (Moir and Ludwig 1979).

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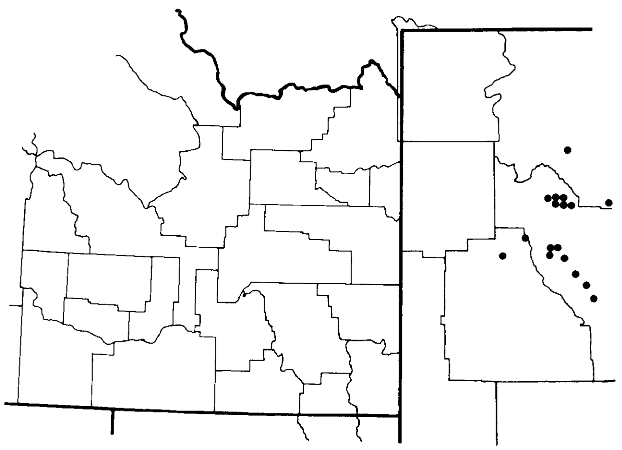
Picea engelmannii/Juniperus communis h.t. (_PIEN/JUCO_; spruce/common juniper)



Distribution.—_PIEN/JUCO_ is a major h.t. in southern portions of the Absaroka Range, the Owl Creek Mountains, and the east flank of the Wind River Range. It occurs widely from about 2 255 to 3 139 m (7,400 to 10,300 feet) and occupies a variety of topographic positions. This h.t. may form upper tree line at about 3 139 m (10,300 feet) on calcareous substrates. Usually it occupies cool exposures, ranging from northwest to east. _PIEN/JUCO_ may border _ABLA/ARCO, PIEN/ARCO, PIFL/JUCO_ or nonforest communities in the Absaroka and Owl Creek Ranges. In the Wind River Range, it usually borders _PSME/JUCO or PSME/ARCO_ on sedimentaries and _PIEN/VASC_ or _PIAL/VASC_ on granitics.

Vegetation.—Tree composition of seral stands is strongly dependent upon parent material; _Pseudotsuga, Picea_, and _Pinus flexilis_ are the primary seral species on calcareous substrates. On extrusive volcanics (chiefly andesites), _P. contorta_ and _Pseudotsuga_ are equally competitive and _P. flexilis_ is a minor species. Sandstones (and granitics?) favor _P. contorta_ as the primary seral species. _Pseudotsuga_ seldom occurred on granitics and only sporadically on sandstones. _P. albicaulis_ was notably absent in much of the h.t..

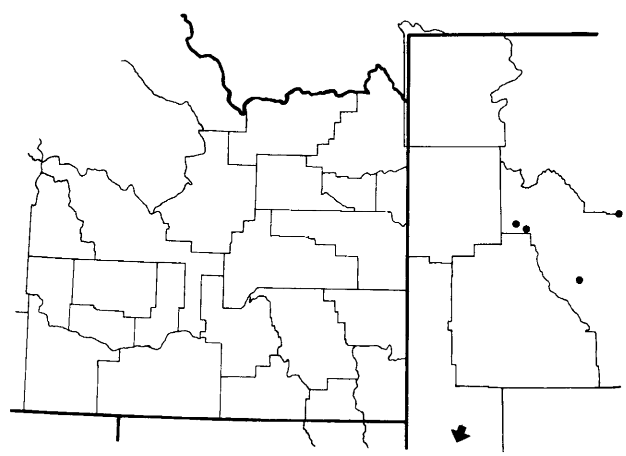
Juniperus communis gradually forms large patches that are easily destroyed by fire. _Shepherdia canadensis_ is often present and in younger stands may be a dominant or codominant shrub. The forb layer is characterized by _Arnica cordifolia_ and _Astragalus miser_ and to a lesser degree by _Solidago multiradiata_. On calcareous substrates _Frasera speciosa_ is usually present. Of the graminoids, only the virtually ubiquitous _Carex rossii_ and _Poa nervosa_ have high constancies.

Soils.—Soil parent materials were primarily calcareous sedimentaries and Absaroka volcanics, but granitics were also represented. The pH ranged from 5.05 (on altered andesite) to 7.3 (on limestone) and averaged 6.4. Areas of bare soil were usually less than 1 percent. Areas of bare rock were usually less than 5 percent. Coarse fraction content, which ranged from 3 to 76 percent and averaged 26 percent, is near the high end of the spectrum for this series. Average litter depths reached 9 cm (3.5 in).

Production/Management.—Timber productivity is mostly low (appendix E-2), especially on calcareous substrates. The low potentials result from the poor site quality for commercial species and a large contribution by _Pinus flexilis_ to stand basal area. Stand regeneration on calcareous substrates appears difficult to achieve. Old cuts on these sites have suffered severe erosion and are still poorly stocked after nearly 100 years since logging. Although grazing pressure may be a contributing factor in these cases, the h.t. as a whole shows little potential for rapid recovery. Forage for domestic livestock and big game species is minimal in older stands, but timber harvesting on noncalcareous soils may enhance forage production. On calcareous substrates _Lupinus_ spp. and _Astragalus miser_ may increase with disturbance and to some extent preclude the increase in range grasses.

Other Studies.—_PIEN/JUCO_ is not described elsewhere; however, a somewhat similar _Picea/Senecio streptanthifolius_ h.t. is described in Montana (Pfister and others 1977).

Picea engelmannii/Ribes montigenum h.t. (_PIEN/RIMO_; spruce/mountain gooseberry)



Distribution.—This minor h.t. was found on gently rolling plateaus of the Wind River Range and in the highest portions of the Owl Creek Range. It also occurs in southern Utah. Although one site occurred on a steep north slope at 2 560 m (8,400 feet), most sites range from 2 743 to 2 956 m (9,000 to 9,700 feet). This h.t. often appears as patches of timber interspersed by grassy meadows and seasonal wetlands.

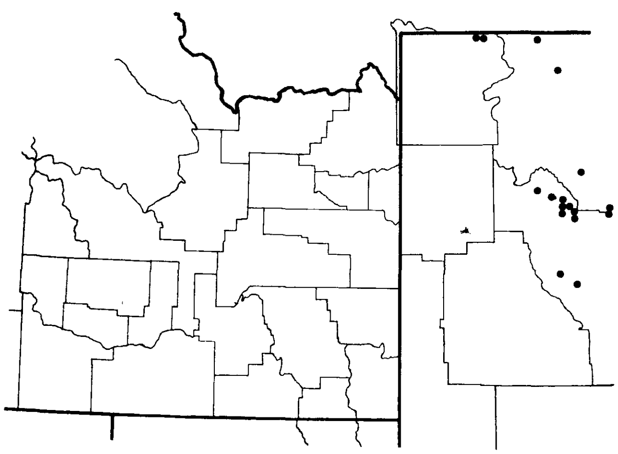
Vegetation.—In seral stands, _Picea_ may be the only tree present, but on granitics it is often accompanied by _Pinus contorta_ or _P. albicaulis_. On limestones and extrusive volcanics, _Picea_ is strongly dominant and mixes primarily with small amounts of _Pinus flexilis_. Rarely _Abies_ is present as unthrifty seedlings or saplings. Undergrowths are depauperate but usually include _Ribes montigenum_ as the principal shrub. _Arnica cordifolia, Aquilegia coerulea_, and _Lupinus_ spp. are the most common forbs.

Soils.—Reconnaissance data indicated that this habitat type occurs on andesite, limestone, and granitic parent materials. The pH values ranged from 4.2 on granite to 6.8 on limestone (average 6.2). Areas of bare rock and bare soil were both less than 2 percent. Average litter depth per site reached 10 cm (3.9 in).

Productivity/Management.—Timber productivity potentials are low (appendix E-2). Where present, *Pinus contorta* should regenerate when canopy openings are created. *Picea* will be favored by smaller openings. Livestock and big game usually find little forage on these sites but may use them as refuges when grazing adjacent meadows. An important function of these sites may be watershed protection and delay of run-off.

Other Studies.—In southern Utah, Pfister (1972a) described a *PIEN/RIMO* h.t. which, because of its extreme geographic separation and floristic differences, should be considered a variant of the above type. Topographic position and site descriptions of Pfister's type, however, are remarkably similar to ours. In the Medicine Bow Mountains of Wyoming, Billings (1969) described "ribbon forests" at the upper forest line that closely resemble the *PIEN/RIMO* and *ABLA/RIMO* h.t.'s.

Picea engelmannii/Arnica cordifolia h.t. (*PIEN/ARCO;* spruce/heartleaf arnica)



Distribution.—*PIEN/ARCO* is a major h.t. from the Absaroka Range southward to the Owl Creek Mountains and Wind River Range. It appears mainly on gentle northwest to easterly aspects from about 2 286 to 3 048 m (7,500 to 10,000 feet). Although *PIEN/ARCO* borders a variety of more moist h.t.'s, adjacent drier sites most often support a sage-grass community.

Vegetation.—*Pseudotsuga* or *Pinus contorta* is the major seral tree, depending on substrate. On calcareous substrates, *Pseudotsuga* with lesser amounts of *Pinus flexilis* codominate seral stands. On volcanics (mainly andesite), *Pseudotsuga* and *Pinus contorta* may be seral dominants, with small amounts of *Pinus flexilis* and *P. albicaulis*. On sandstones and possibly granitics, *Pinus contorta* with lesser amounts of *P. albicaulis* are the major seral trees. Usually *Picea* codominates with the seral trees in older stands (fig. 14).

Undergrowths have the general appearance of the *PIEN/JUCO* h.t. but lack the shrub component. Of the forbs, *Arnica cordifolia* and *Astragalus miser* weakly dominate; *Senecio streptanthifolius* and *Frasera speciosa* attain high constancies but have low coverages on calcareous substrates. *Hesperochloa kingii* and *Carex rossii* also have high constancies on these sites.

Soils.—Soil parent materials range from limestone to granitics and Absaroka volcanics, which are mainly andesite. The pH ranges from 4.2 on quartzite to 7.1 on limestone and averages 5.8. Although soil surfaces are comparatively free of exposed rock and bare soil, the coarse-fraction content ranges up to 48 percent and averages 18 percent. Average litter depths can reach 8 cm (3.1 in).

Productivity/Management.—Timber productivity on these sites is moderate on volcanics to low on calcareous substrates (appendix E-2). Management implications parallel those of the *PIEN/JUCO* type. Regeneration problems on limestones appear severe. Opening stands via clearcutting may create severe microclimatic conditions that retard tree regeneration and may result in increased coverages of *Astragalus, Arnica*, and *Lupinus* spp. On volcanics and granitics, *P. contorta* may establish readily in forest clearings when a seed source is nearby. Forage production is low for big game and domestic livestock, though the sites are used as cover for deer, elk, and cattle. There is little potential for increasing forage production through timber harvesting.

Other Studies.—*PIEN/ARCO* has not been described elsewhere. A somewhat similar *Picea/Senecio streptanthifolius* h.t. that occurs only on calcareous substrates is described in Montana (Pfister and others 1977).

Picea engelmannii/Hypnum revolutum h.t. (*PIEN/HYRE;* spruce/hypnum)

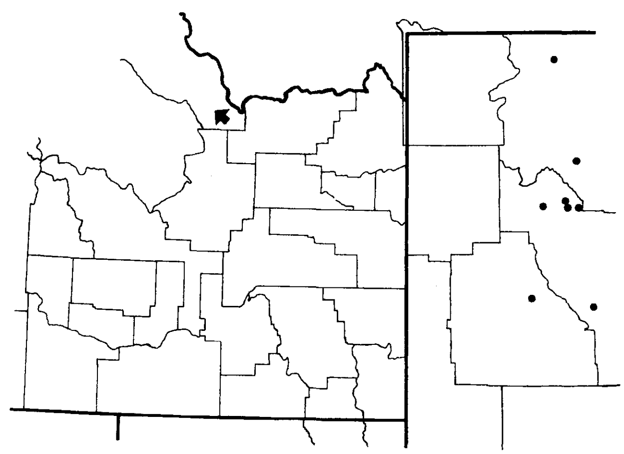


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Figure 14.—*Picea engelmannii/Arnica cordifolia* h.t. on a gentle east slope in the Absaroka Range northwest of Cody, Wyo. (2 286 m, 7,500 feet). An all-age stand of *Picea* is replacing old *Pinus contorta*. An occasional *Pseudotsuga* and *Abies* are also present. *Arnica* dominates a depauperate undergrowth.

Distribution.—This minor h.t. occurs in the Owl Creek, southern Absaroka, and Wind River Ranges of Wyoming and also appears in the Lemhi and Beaverhead Ranges of east-central Idaho. It is found from about 2 347 to 3 200 m (7,700 to 10,500 feet) but appears restricted to steep northerly aspects where snow accumulates and persists into the growing season. This h.t. usually borders open meadows or *Festuca idahoensis* dominated grasslands on drier exposures or rockier soils. Downslope it merges with *PIEN/ARCO* and *PIEN/JUCO* in the Absaroka and Owl Creek Ranges and with the *Abies lasiocarpa* series in the Wind River Range.

Vegetation.—At lower elevations of the h.t., *Pseudotsuga* predominates in most stands with lesser amounts of *Picea* and *Pinus flexilis* occurring throughout. In old-growth stands, regeneration of *Picea* and *Pseudotsuga* is often equal. At the higher elevations, *Pseudotsuga* becomes scarce leaving *Picea* and occasionally some *Pinus albicaulis* to dominate the site.

Shrubs are very sparse and, if present, usually include *Shepherdia canadensis, Symphoricarpos oreophilus*, or *Juniperus communis*. A few forbs or grasses may be present in small amounts; of these, *Pyrola secunda, Arnica cordifolia*, and *Poa nervosa* are most common. Unless disturbed, a thin layer of moss, *Hypnum revolutum*, dominates the undergrowth (fig. 15). Other mosses may be scarce but *Dicranowiesia crispula* is usually present on rotting wood. *Peltigera rufescens*, a foliose lichen, is usually evident throughout the stand and *Cladonia fimbriata* is usually the common lichen on rotting wood.

Soils.—Soil parent materials were primarily Absaroka volcanics (rhyolite and andesite) but also included some limestone and granitics. Soil pH ranged from 5.3 on granitics to 7.9 on limestone and averaged 6.1. Coverages of bare rock reached 25 percent but were usually less than 5 percent. Coarse fraction content was also high and averaged 36 percent. Areas of bare soil were mostly less than 1 percent. Average litter depth per site reached 13 cm (5.1 in) but was mostly less than 7 cm (2.8 in).

Productivity/Management.—Timber productivity potential is low to very low, especially for the higher elevation stands (appendix E-2). Diameter increments for both *Picea* and *Pseudotsuga* decline rapidly at a relatively early age. Considering the steep slopes and low potential productivities for timber and forage, the greatest resource values of this h.t. may be for water yields and big game cover.

Figure 15.—*Picea engelmannii/Hypnum revolutum* h.t. on a northwest aspect in the Mud Creek drainage of the Owl Creek Mountains (3 030 m, 9,940 feet). A pure stand of *Picea engelmannii* dominates this moderately steep slope. In the undergrowth, vascular plants are virtually nil and the prostrate moss, *Hypnum revolutum*, is abundant.

Other Studies.—This habitat type is also described in the southern half of the Lemhi and Beaverhead Ranges of east-central Idaho (Steele and others 1981). A *Picea engelmannii*/moss h.t. is reported for Arizona and New Mexico (Moir and Ludwig 1979), but the vascular undergrowth is quite different and the cryptogams are not identified.

Abies Lasiocarpa Series

Distribution.—The *Abies lasiocarpa* series is the most extensive forest series in the study area. It is common in all major mountain ranges except along the eastern flank of the Absaroka Range, the Owl Creek Range, and southern portions of the Wind River Range. Typically, it borders the *Pseudotsuga* series at its lower limits and alpine communities or grassy balds at its upper limits. In some areas, its upper limits border the *Pinus albicaulis* series. On the crest of the Wind River Range, the *Abies lasiocarpa* series sometimes gives way to pure *Picea engelmannii* communities.

Vegetation.—*Pinus contorta* is the major seral tree throughout most of this series. Its successional role varies, however, from an early successional species in relatively moderate environments to one that reproduces and persists as a dominant for many decades on very severe sites. Seral *Pseudotsuga* also occurs throughout much of the series but is a major dominant in only the warmer portions where *Pinus contorta* is less abundant. *Picea engelmannii* appears throughout most of the series and becomes codominant on increasingly wetter sites. On eastern slopes of the Absaroka, Wind River, and Owl Creek Ranges, *Picea* also becomes codominant near the dry extreme of this series. *Populus tremuloides* commonly persists on the fringes of *Abies lasiocarpa* communities and as small unthrifty trees within the stand. In these situations the *Populus* may readily dominate disturbed sites by sprouting from existing root systems and may become a major seral species in various parts of the series. Although field observation suggests a ubiquity of *Populus*, our data show little or no occurrence in h.t.'s or phases with undergrowths dominated by *Vaccinium scoparium*. Undergrowths in the *Abies lasiocarpa* series vary considerably and include dense, tall shrub layers; lush, moist-site forb layers; depauperate layers of dry-site forbs, and open grassy layers.

Soils.—Soil parent materials varied from granitics and volcanics to sedimentaries. Although h.t.'s and parent materials showed little overall correlation, the most common parent material in this series was sandstone. Some local exceptions occurred in the southeastern portion of the study area where *Abies* was notably absent on calcareous material. Other soil characteristics are best described at the h.t. level.

Fire.—Fires have altered most vegetation in this series and have created many of the *Populus tremuloides* and *Pinus contorta* stands that are found here. Many of these stands are initially fire resistant, but as they mature, susceptibility to insects and disease increases. Dead material resulting from these attacks increases the available fuel and the susceptibility to fire damage.

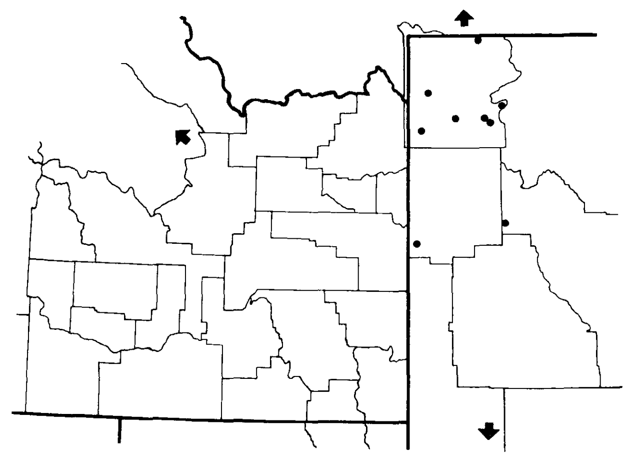
Undergrowths can also change after a fire, and form a layer characteristic of fire history. At lower elevations, *Calamagrostis rubescens* may persist under near climax conditions and then increase substantially when fire removes the competition. *Shepherdia canadensis* apparently increases following burning and may dominate the undergrowth beneath *Pinus contorta* and *Populus tremuloides*. *Shepherdia* then declines as the canopies of *Picea* and *Abies* increase and create denser shade.

Productivity/Management.—The low-elevation sites in this series are usually the most productive. Here *Pseudotsuga* may be the most productive timber species, but regeneration may be difficult. *Pinus contorta* responds better to silvicultural treatments and is fairly productive throughout much of this series. *Picea* also grows well on many sites but is prone to windthrow in partially cut stands, especially where water tables are high.

On some low-elevation sites where big game browse is in a seral condition and is fairly productive, big game has had a significant impact on secondary succession. Overwintering moose have browsed young *Abies lasiocarpa* to the point that succession is retarded and some stands superficially appear as *Pseudotsuga* or *Picea* climax. Only close examination of these stands will reveal the remnants of *Abies* as the indicated climax species. In other stands many woody plants have been reduced by browsing. In these situations, the greatest impact has been on major seral species such as *Amelanchier, Prunus*, and *Populus tremuloides*. Reduction of only the seral species hastens succession toward climax with less suitable food available for big game. In this case, logging or burning the stand may renew production of the browse species.

The high-elevation sites in this series generally have low timber potential and are used mainly for recreation, wildlife, and snowpack management.

Abies lasiocarpa/Calamagrostis canadensis h.t. (*ABLA/CACA*; subalpine fir/bluejoint)



Distribution.—This minor h.t. was found mainly in the vicinity of Yellowstone National Park. It occurs more widely in Montana, central Idaho, and parts of Utah. *ABLA/CACA* ranges from 2 073 to 2 774 m (6,800 to 9,100 feet) and usually appears along stream terraces, pond margins, and moist toeslopes. It comprises some of the wettest sites in this series.

Vegetation.—*Pinus contorta* and *Picea engelmannii* are the major seral conifers. *Abies lasiocarpa* eventually dominates the old-growth stands. Usually *Calamagrostis canadensis* is conspicuous in the undergrowth but may codominate with different species, depending on the phases noted below. Shrubs characteristic of drier sites may grow on hummocks or at the base of trees. Wet-site forbs and various *Carex* species are common in the low spots.

Ledum glandulosum (*LEGL*) phase.—This phase is incidental to the study area but was found from 2 316 to 2 682 m (7,600 to 8,800 feet) in Yellowstone National Park. Its main distribution occurs in central Idaho (Steele and others 1981). Generally this phase indicates a cool extreme of the h.t. *Ledum glandulosum* usually dominates the undergrowth; lesser amounts of other shrubs are often present.

Vaccinium caespitosum (*VACA*) phase.—This incidental phase was observed in Yellowstone National Park. Its main occurrence lies in Montana (Pfister and others 1977) and central Idaho (Steele and others 1981). Usually it indicates a frostpocket condition. These sites are often dominated by a persistent seral stand of *Pinus contorta* with lesser amounts of *Picea* and *Abies*. *Vaccinium caespitosum* is common throughout the stand.

Calamagrostis canadensis (*CACA*) phase.—This is the typical phase in our area. It was found from 2 073 to 2 774 m (6,800 to 9,100 feet) mainly in the general vicinity of Yellowstone National Park. *Calamagrostis canadensis* often dominates the undergrowth and obscures the forb layer (fig. 16). Other features of this phase correspond to the general description of the h.t.

Figure 16.—*Abies lasiocarpa/Calamagrostis canadensis* h.t., *Calamagrostis* phase on a broad wet bench in the Wind River Range west of Dubois, Wyo. (2 774 m, 9,100 feet). Large *Picea engelmannii* dominate an understory of *Abies* and *Picea*. *Calamagrostis* dominates a diverse undergrowth of wet-site forbs and graminoids.

Productivity/Management.—Timber potentials tend to be low (appendix E-2). *Pinus contorta* may be the easiest conifer to regenerate, but *Picea* may yield more timber. Regeneration of *Abies lasiocarpa* is often sporadic and may require the raised microsites of hummocks and fallen logs. In most cases, partial cutting leaves the remaining large trees prone to windthrow. Overstory removal permits the water table to rise and allows the *Calamagrostis* and *Carex* to increase and outcompete conifer seedlings. Livestock may find considerable forage here and the adjacent streams attract many animals. But until late summer, after the site has dried somewhat, the animals can churn the wet soil and destroy plant cover as well as the conifer seedlings. In some areas, bear, elk, or moose may use these sites for wallows and forage. Seral stands can produce willows and sedges, which are sought by moose and elk. The streamside locations may attract recreationists, but these wet sites are poorly suited for roads, trails, and recreational development.

Other studies.—Cooper (1975) previously noted *ABLA/CACA* in northwestern Wyoming. This h.t. is also reported from Montana (Pfister and others 1977), central Idaho (Steele and others 1981), and northeastern Utah (Henderson and others 1977 unpubl.).

Abies lasiocarpa/Streptopus amplexifolius h.t. (*ABLA/STAM;* subalpine fir/twisted stalk)

Distribution.—*ABLA/STAM* is an incidental h.t. in the study area. It occurs mainly in central Idaho and northeastern Utah. Usually it is found at about 2 438 m (8,000 feet) as a narrow stringer along streams and seeps. These sites appear influenced by a high water table most of the year.

Vegetation.—*Picea* usually dominates the stand as a long-lived seral species. In openings, seral undergrowths normally appear as lush tall-forb communities that usually include *Senecio triangularis*. Beneath a tree canopy, these forbs become more sparse and the shade-tolerant *Streptopus* becomes more evident. Rivulets bordered by high coverages of *Saxifraga arguta* are common.

Productivity/Management.—Timber potentials may be moderate to high, but the high water tables create serious problems for timber management. Livestock forage is often abundant in seral stands, but the animals can easily churn the wet soil with their hooves and destroy the plant cover. In some areas, these sites may provide important forage and cover for elk and moose and the wet spots make good wallows. High water tables associated with these sites may preclude development of roads, trails, and recreation facilities.

Other studies.—Steele and others (1981) described two phases of *ABLA/STAM* in central Idaho; Henderson and others (1977 unpubl.) note it in the Uinta Mountains of Utah. Only the *Streptopus amplexifolius* phase is known from our area and from Utah. In Montana, Pfister and others (1977) describe an *ABLA/CACA* h.t., *Galium triflorum* phase and *ABLA/GATR* h.t. that appear related to our *ABLA/STAM* h.t.

Abies lasiocarpa/Menziesia ferruginea h.t. (*ABLA/MEFE*; subalpine fir/menziesia)

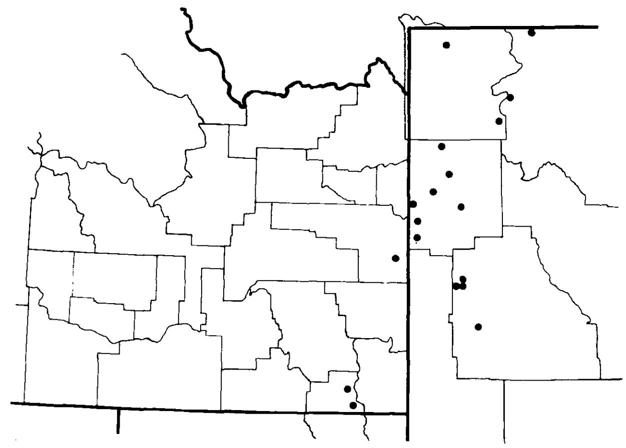
Distribution.—This incidental h.t. occurs locally on eastern slopes of the Teton Range. Here it occupies the moist ravines overlooking Jenny, Leigh, and String Lakes in Grand Teton National Park. It has also been observed in minor amounts, less than 20 acres total, on the northern portion of the Bridger-Teton National Forest (Andrew Youngblood, Bridger-Teton National Forest, pers. comm.). Its main distribution lies in northern Idaho and western Montana.

Vegetation.—Usually *Picea* is the major seral tree species. *Pinus contorta* and *Pseudotsuga* may be present in minor amounts. *Menziesia* usually dominates the undergrowth and forms a tall, dense layer.

Productivity/Management.—Data from other studies noted below suggest that timber potentials are moderate. *Picea* appears most productive and should regenerate in partially shaded openings. If *Alnus sinuata* is present, it can easily invade exposed soil in forest openings and remain dominant for many years. Domestic livestock seldom find much forage here, but big game may benefit from the dense cover and browse.

Other studies.—*ABLA/MEFE* is reported in northern Idaho (Daubenmire and Daubenmire 1968) and in western Montana (Pfister and others 1977). It also occurs in central Idaho (Steele and others 1981) where two phases exist. Only the *Menziesia ferruginea* phase is known from our area.

Abies lasiocarpa/Actaea rubra h.t. (*ABLA/ACRU*; subalpine fir/baneberry)



Distribution.—*ABLA/ACRU* is a minor h.t. from Yellowstone Park to the Idaho-Utah border. It ranges from about 2 042 to 2 499 m (6,700 to 8,200 feet). These are usually low to mid-elevations of the *Abies lasiocarpa* series. It occurs on moist but drained alluvial terraces, lower slopes, and occasionally old landslides.

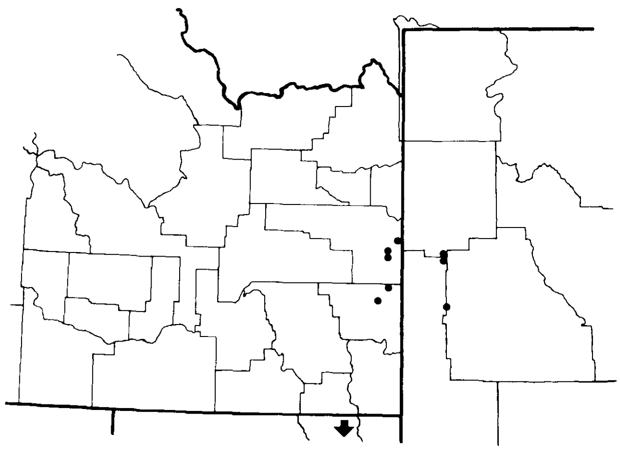
Vegetation.—*Picea engelmannii* is the major seral tree and often codominates with *Abies lasiocarpa* in old-growth stands. Lesser amounts of *Pinus contorta* and sometimes *Pseudotsuga* or *Picea pungens* may be present. Undergrowths vary somewhat but usually include *Lonicera utahensis* and *Vaccinium globulare. Rubus parviflorus* is often present on disturbed sites and *Acer glabrum* becomes prominent on sites mainly south of Alpine, Wyo. *Actaea rubra* is the characteristic species in the undergrowth and usually forms small clumps throughout the h.t. Adjacent drier sites are usually the *ABLA/VAGL* or *ABLA/ACGL* h.t. Wetter sites, if not riparian, are usually *ABLA/STAM* or *PIEN/EQAR*.

Soil.—Soil parent materials varied but were mainly of sedimentary origin. The pH ranged from 5.2 to 7.4 and averaged 6.4. Most sites had very little bare rock or bare soil. Average litter depth on a site can reach 20 cm (7.9 in).

Productivity/Management.—Timber potentials are moderate to high (appendix E-2). *Picea* regeneration appears to establish easily wherever the shrub layer is reduced, but *Abies* regeneration may be sporadic. When present, *Pinus contorta* and *Pseudotsuga* may be highly productive. Big game find considerable food and cover in the diverse assemblage of shrubs and forbs on these sites. This feature coupled with the proximity to streams results in fairly heavy use by moose. This h.t. may indicate unstable depositional soils, which can pose hazards to road and trail construction.

Other studies.—In Montana, Pfister and others (1977) describe an *Abies lasiocarpa/Galium triflorum* h.t. that appears to be related to the *ABLA/ACRU* h.t. in some respects. Cooper (1975) describes a few stands in the Teton Range as part of the Montana *ABLA/GATR* h.t. These plots are now included in the *ABLA/ACRU* h.t., which has not been described in other studies.

Abies lasiocarpa/Physocarpus malvaceus h.t. (*ABLA/PHMA;* subalpine fir/ninebark)



Distribution.—*ABLA/PHMA* is a minor h.t. that occurs from the Hoback River and near Alpine, Wyo., southward into Utah. It usually occupies fairly steep northerly aspects from about 1 829 to 2 255 m (6,000 to 7,400 feet) and represents the warm lower limits of the *Abies lasiocarpa* series in those areas.

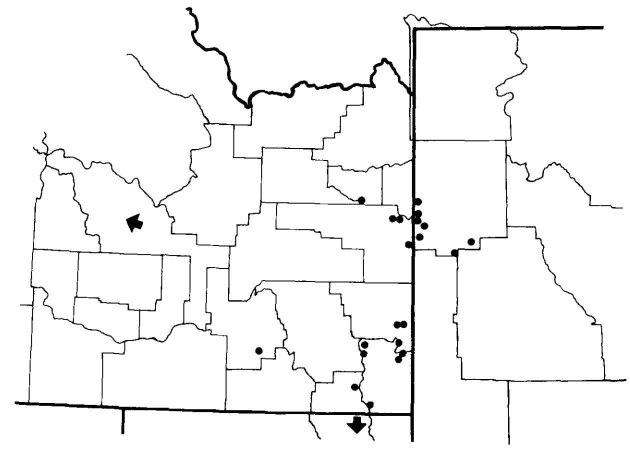
Vegetation.—*Pseudotsuga* is the major seral tree and often codominates with *Abies lasiocarpa* in old-growth stands. Lesser amounts of *Picea* are often present, but other seral conifers seldom grow here. *Physocarpus malvaceus* dominates an undergrowth that usually includes *Amelanchier, Pachistima, Spiraea, Acer glabrum*, and *Clematis columbiana*. The most common forbs are *Disporum trachycarpum, Fragaria vesca*, and *Arnica cordifolia*.

Soil.—Soil parent materials were mainly sandstone. The pH ranged from 5.7 to 7.7 and averaged 6.5. Coverage of bare rock was usually less than 3 percent and areas of bare soil were generally nil. The maximum average litter depth on a site was 8 cm (3.1 in).

Productivity/Management.—Timber productivity potential is generally moderate (appendix E-2). *Pseudotsuga* should regenerate easily wherever openings in the shrub and tree canopies coincide. *Abies lasiocarpa* appears fairly productive and should regenerate well where the shrub layer is reduced. In some areas, big game use this h.t. extensively for food and cover. Moose, especially, have depleted the *Abies*, giving some sites the appearance of a *PSME/PHMA* h.t.

Other studies.—Henderson and others (1976 unpubl.) previously described this h.t. in northern Utah and adjacent Idaho. Although no other studies have reported an *ABLA/PHMA* h.t., Pfister and others (1977) report a *PICEA/PHMA* h.t. in Montana that contains some *Abies lasiocarpa*.

Abies lasiocarpa/Acer glabrum h.t. (*ABLA/ACGL;* subalpine fir/mountain maple)



Distribution.—Most of the *ABLA/ACGL* h.t. occupies minor acreages from about the latitude of Driggs, Idaho, southward into Utah. It also occurs in central Idaho. It ranges from about 1 737 to 1 316 m (5,700 to 7,600 feet) on steep to moderate slopes having northerly aspects. This h.t. usually represents low elevations of the *Abies lasiocarpa* series. Toward its northern limits, *ABLA/ACGL* often merges with the *ABLA/VAGL* h.t.

Vegetation.—*Pseudotsuga* and *Picea* are the dominant seral trees and usually codominate with *Abies* in older stands. *Pinus contorta* is occasionally present as a minor seral species. Tall shrubs that include *Acer glabrum, Sorbus scopulina*, and in seral stands, *Amelanchier alnifolia* dominate the undergrowth (fig. 17). *Pachistima myrsinites* is usually present in a subordinant shrub layer that may include *Rubus parviflorus, Lonicera utahensis*, and *Vaccinium globulare*.

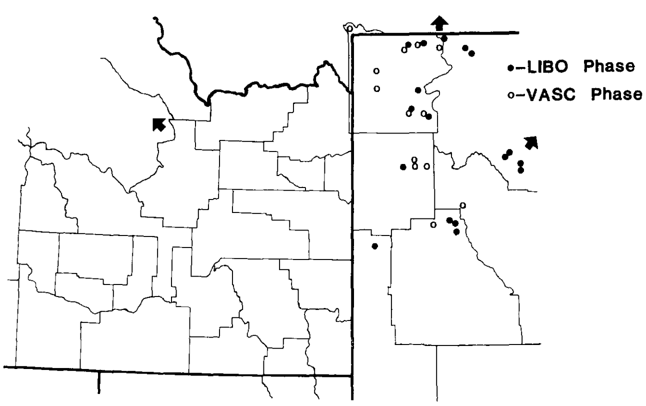
Soil.—Soil parent materials were mainly sandstone and some limestone. The pH ranged from 5.1 to 6.3 and averaged 5.7. Usually areas of bare rock or bare soil were negligible. Average litter accumulation on a site reached 8 cm (3.1 in).

Productivity/Management.—Timber potential is moderate (appendix E-2). *Pseudotsuga* is usually the most productive timber species and should regenerate easily on seedbeds of exposed soil that occur where the tree and shrub canopy is removed. Planted seedlings of *Pseudotsuga* should do well on carefully prepared sites that benefit from partial shade (Kittams and Ryker 1975). *Abies lasiocarpa* is the tree best suited for establishing beneath the shrub layer. Reducing the tree canopy should stimulate the shrub layer and provide additional forage for big game.

Figure 17.—*Abies lasiocarpa/Acer glabrum* h.t., *Pachistima* phase on a northeast slope in St. Charles Canyon, Bear River Range (2 301 m, 7,550 feet). A young stand of *Pseudotsuga* with *Abies* in the understory overtops a shrub layer composed mainly of *Acer, Sorbus, Amelanchier, Salix scouleriana*, and *Pachistima*. The forb layer is quite sparse.

Other studies.—Henderson and others (1976 unpubl.) described this h.t. in southeastern Idaho and adjacent Utah. Steele and others (1981) described *ABLA/ACGL* in central Idaho and considered it the *Acer glabrum* phase. The only phase known in the study area is the *Pachistima myrsinites* phase.

Abies lasiocarpa/Linnaea borealis h.t. (*ABLA/LIBO;* subalpine fir/twinflower)



Distribution.—*ABLA/LIBO* occurs as a minor h.t. from the Wind River Range northward through the Absaroka Range and into Montana. A few sites also occur in north-central Wyoming and central Idaho. It appears mostly on gentle slopes and benches from about 2 164 to 2 591 m (7,100 to 8,500 feet). Usually it occurs within the low to mid-elevations of the *Abies lasiocarpa* series.

Vegetation.—*Pinus contorta* and *Picea* are the major seral trees. *Picea* is more persistent, however, and often codominates with *Abies lasiocarpa* in old-growth stands. Occasionally *Pseudotsuga* is also present in seral stands. *Linnaea* is common throughout the stand even though other shrubs may create the dominant aspect. *Arnica cordifolia* is the most common forb throughout the h.t.

Vaccinium scoparium (*VASC*) phase.—This phase apparently represents a broad transition to the colder *ABLA/VASC* h.t. *Vaccinium scoparium* normally dominates the undergrowth and *Lonicera utahensis* is often present.

Linnaea borealis (*LIBO*) phase.—The *LIBO* phase appears to have a more moderate environment than the *VASC* phase; *Berberis, Shepherdia*, and *Rosa* spp. occur here more frequently. *Shepherdia* and occasionally other shrubs may increase following disturbance, but the shrubs in general are widely scattered and have thin canopies.

Soil.—Soil parent materials included basalt, andesite, granitics, quartzite, and sandstone. In the *LIBO* phase, soil pH ranged from 5.0 to 6.8 and averaged 6.0. It was slightly lower in the *VASC* phase where it ranged from 4.9 to 5.6 and averaged 5.2. In both phases, areas of bare rock or bare soil were usually less than 1 percent, and average litter depths reached 9 cm (3.5 in).

Productivity/Management.—Timber potentials are usually low to moderate (appendix E-2), but the gentle terrain often found in this h.t. can facilitate intensive timber management. *Pinus contorta* should regenerate easily on most sites having suitable openings. *Picea* and occasionally *Pseudotsuga* should regenerate well in partial shade, especially in the *LIBO* phase. *Abies* regeneration may establish slowly and sporadically.

Livestock may be attracted by the gentle terrain of these sites, which offer mostly *Calamagrostis rubescens* as forage. The animals cause little damage except for the trampling of tree seedlings.

Moose and sometimes elk use these sites extensively. The moose browse heavily on *Abies* here and often kill or deform the young trees.

Other studies.—Cooper (1975) first described this h.t. in the study area as the *Picea-Abies/Linnaea borealis* h.t. The *ABLA/LIBO* h.t. was also described in Montana (Pfister and others 1977) and in central Idaho (Steele and others 1981). A few stands recorded by Hoffman and Alexander (1976) in the Bighorn Mountains of Wyoming also conform to this h.t. The *Abies lasiocarpa/Vaccinium scoparium-Linnaea borealis* h.t. in New Mexico (Moir and Ludwig 1979) appears to be related to our *ABLA/LIBO* h.t., *VASC* phase.

Abies lasiocarpa/Xerophyllum tenax h.t. (*ABLA/XETE*; subalpine fir/beargrass)

Distribution.—This incidental h.t. occurs locally near the southern border of Yellowstone National Park. Its main distribution lies in western Montana and northern Idaho and extends southward into the northern part of central Idaho.

Vegetation.—*Pinus contorta* is a common seral dominant throughout the h.t. and, in some areas, *Picea* and *Pseudotsuga* may appear in small numbers. *Vaccinium scoparium* or *Vaccinium globulare* may be present in various amounts.

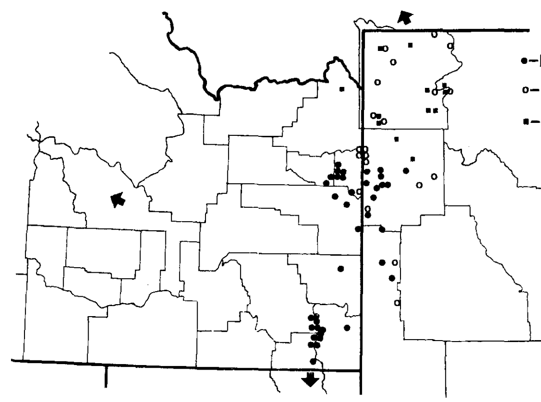
Vaccinium globulare (*VAGL*) phase.—This phase delineates the more moderate segment of the h.t. *Pseudotsuga* is more common in this phase and *Picea* often attains higher coverages. *Vaccinium globulare* usually codominates the undergrowth with *Xerophyllum*.

Vaccinium scoparium (*VASC*) phase.—The *VASC* phase marks the upper elevations of the h.t. *Pinus contorta* is the major seral tree and small amounts of *Picea* are usually present. *Vaccinium scoparium* usually dominates between the clumps of *Xerophyllum*, which are often widely spaced. *Vaccinium globulare* is usually sparse.

Productivity/Management.—Data from other studies noted below suggest that timber potentials are low to moderate. *Pinus contorta* is usually the most productive species and should regenerate well in openings that receive full sunlight. Occasionally *Picea* or *Pseudotsuga* are suitable timber species in the *VAGL* phase. Livestock find little forage here, but in summer and fall deer and elk use these sites for food and cover.

Other studies.—*ABLA/XETE* is more common in Montana (Pfister and others 1977), central Idaho (Steele and others 1981), and northern Idaho (Daubenmire and Daubenmire 1968). Both Horton (1971 unpubl.) and Cooper (1975) have described small areas of *ABLA/XETE* in the study area.

Abies lasiocarpa/Vaccinium globulare h.t. (*ABLA/VAGL*; subalpine fir/blue huckleberry)



Distribution.—*ABLA/VAGL* occurs extensively from Yellowstone National Park southward into northern Utah. It also occurs in Montana and central Idaho. In the study area this h.t. ranges from 1 737 to 2 652 m (5,700 to 8,700 feet) and occurs mainly on northerly to easterly aspects. Generally, it represents low to mid-elevations of the *Abies lasiocarpa* series.

Vegetation.—*Pinus contorta* and *Picea* are common seral dominants throughout the h.t. and are usually mixed with younger *Abies lasiocarpa*. *Vaccinium globulare* forms a dominant layer in the undergrowth. Other features vary with phases noted below.

Vaccinium scoparium (*VASC*) phase.—This phase occurs from 2 012 to 2 591 m (6,600 to 8,500 feet) and represents the cooler segment of *ABLA/VAGL*. The low-elevation sites in this phase are usually in frost pockets. Adjacent cooler sites are usually *ABLA/VASC* h.t. *Pinus contorta* and *Picea* dominate seral stands. *Pseudotsuga* is normally absent. *Vaccinium scoparium* usually forms a notable layer beneath *V. globulare*. *Amelanchier, Pachistima*, and *Spiraea*, which are common to the other phases, are rare in the *VASC* phase.

Pachistima myrsinites (*PAMY*) phase.—This is the common phase from about the latitude of Driggs, Idaho, southward into northern Utah. It ranges from 1 737 to

Figure 18.—*Abies lasiocarpa/Vaccinium globulare* h.t., *Pachistima* phase on a north slope in the Big Hole Mountains west of Driggs, Idaho (2 118 m, 6,950 feet). *Pseudotsuga* and *Picea* dominate an understory of *Abies*. *Vaccinium* dominates a rather diverse undergrowth.

2 652 m (5,700 to 8,700 feet) and represents a geographic variant of the *ABLA/VAGL* h.t. *Pachistima* provides the best nomenclatural distinction because it appears in most stands of this phase and is totally absent in the *VAGL* phase. This phase indicates a relatively moderate environment and often borders the *ABLA/ACGL* h.t. or the *Pseudotsuga* series on warmer sites. Adjacent cool, dry sites are often *ABLA/CARU* h.t. Usually *Pseudotsuga* and *Aster engelmannii* are more prevalent here than in the *VASC* phase (fig. 18).

Vaccinium globulare (*VAGL*) phase.—The *VAGL* phase barely enters our area from Montana. It occurs mainly in the vicinity of Yellowstone National Park where it ranges from 2 255 to 2 438 m (7,400 to 8,000 feet). *Spiraea betulifolia* is a common undergrowth component in this phase.

Soils.—Soil parent materials in the *PAMY* and *VASC* phases were mainly sandstone but also included quartzite, andesite, rhyolite, and granitics. In both phases, the pH was similar; it ranged from 4.6 to 5.8 and averaged 5.3. Areas of bare soil and rock were usually less than 2 percent and average litter depth per site reached 13 cm (5.1 in). Soils data are lacking for the *VAGL* phase.

Productivity/Management.—Timber potential appears low to moderate (appendix E-2). *Pseudotsuga* grows well in the *PAMY* phase and should regenerate easily in small openings. On most sites, *Pinus contorta* readily invades following fire or logging and creates a light canopy that may benefit *Picea* and *Abies* seedlings. When the tree canopy is reduced near the moist extreme of this h.t., *Vaccinium globulare* may increase and compete with conifer seedlings. Most of these sites offer little forage or browse for large herbivores. Berry crops of *Vaccinium*, however, create a periodic demand for these sites by bears, grouse, and humans and may warrant management in some areas.

Other studies.—Both Henderson and others (1976 unpubl.) and Cooper (1975) have described the *ABLA/VAGL* h.t. in our area. It is also reported from Montana (Pfister and others 1977) and central Idaho (Steele and others 1981).

Abies lasiocarpa/Luzula hitchcockii h.t. (*ABLA/LUHI*; subalpine fir/smooth woodrush)

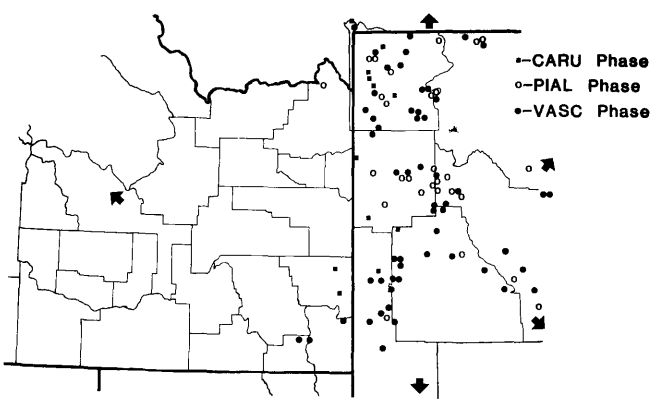
Distribution.—This incidental h.t. occurs locally in the Teton Range. Its main distribution lies in western Montana and central Idaho. *ABLA/LUHI* appears at the upper elevations of the *Abies lasiocarpa* series where snow persists late into the growing season.

Vegetation.—*Picea engelmannii, Pinus contorta*, and *Pinus albicaulis* are considered the common seral dominants, but succession is so slow that *Picea* and *Pinus albicaulis* usually persist in the stand. Patches of *Luzula hitchcockii* usually occur beneath a layer of *Vaccinium scoparium*.

Productivity/Management.—Data from other studies noted below suggest that timber potentials are low and it may be difficult to achieve regeneration after logging. Heavy snowpacks often deform the smaller trees and regeneration of *Abies* may be largely vegetative. The deep snowpacks also indicate that water is a key resource for management consideration.

Other studies.—*ABLA/LUHI* was first described in Montana (Pfister and others 1977) as a slightly broader h.t. It is also described in central Idaho where two phases occur (Steele and others 1981). Only the *Vaccinium scoparium* phase is known from the study area.

Abies lasiocarpa/Vaccinium scoparium h.t. (*ABLA/VASC*; subalpine fir/grouse whortleberry)



Distribution.—This h.t. occupies extensive acreages throughout much of western Wyoming and Yellowstone National Park. It extends southward into northern Utah and Colorado and northward into Montana. It is also common in other areas (see other studies). In our study area it ranges from 1 981 to 2 987 m (6,500 to 9,800 feet) and occupies a variety of slopes and aspects at mid- to upper elevations of the subalpine fir series.

Vegetation.—This is one of the most widespread forest h.t.'s in the study area, yet it retains a high degree of floristic homogeneity. *Pinus contorta* dominates seral stands throughout most of the type and *Picea* and *Pseudotsuga* may be present in various amounts depending on the phases noted below. Although *Abies lasiocarpa* is the indicated climax, stands actually dominated by *Abies* are quite rare. A low cover of *Vaccinium scoparium* usually dominates the undergrowth. Other shrubs, if present, are generally sparse and widely scattered.

Calamagrostis rubescens (*CARU*) phase.—This phase ranges from 1 981 to 2 408 m (6,500 to 7,900 feet) and represents the warm lower segment of the h.t. *Pinus contorta* is the major seral dominant; small amounts of *Pseudotsuga* may be present. *Calamagrostis rubescens* may codominate the undergrowth with *Vaccinium* and *Pachistima*. *Geranium viscosissimum* and *Viola adunca* appear more frequently here than in the other phases.

Pinus albicaulis (*PIAL*) phase.—The *PIAL* phase ranges from 2 438 to 2 987 m (8,000 to 9,800 feet) and represents the cold upper elevations of *ABLA/VASC*. It is most common from the Wind River Mountains northward into Montana. *Pinus albicaulis* codominates most stands, with *Abies, Picea*, and *Pinus contorta*. These stands appear more open than in the other phases and apparently afford *Pinus albicaulis* a persistent role in the forest community. Conceptually, this phase represents a transition between the *ABLA/VASC* and *PIAL/VASC* h.t.'s.

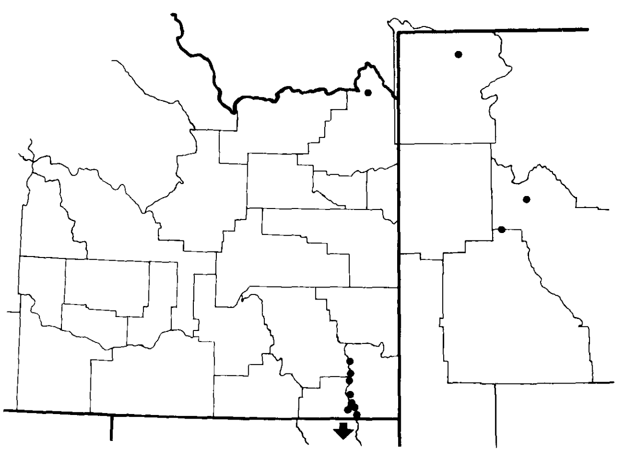
Vaccinium scoparium (*VASC*) phase.—The *VASC* phase ranges from 1 890 to 2 987 m (6,200 to 9,800 feet) and is the most common phase throughout the area. *Pinus contorta* dominates most seral stands until replaced by *Picea* and *Abies*. *Pedicularis racemosa, Pyrola secunda*, and *Arnica cordifolia* are common forbs here but usually have low coverages. As opposed to the other two phases, the *VASC* phase frequently has a conspicuous moss layer. The most common mosses are *Brachythecium collinum, B. velutinum*, and *Polytricadelphus lyallii*.

Soils.—Soil parent materials were mainly sandstone and granitics but also included shale, quartzite, and andesite. The pH ranged from 3.8 to 6.2 and averaged 5.0. Areas of bare rock were usually less than 5 percent but occasionally reached 30 percent. Areas of bare soil were usually less than 1 percent. Average litter depth on a site reached 10 cm (3.9 in). These soil characteristics differed only slightly between phases.

Productivity/Management.—Timber productivity ranges mainly from low to moderate (appendix E-2). *Pinus contorta* will regenerate in unshaded openings but complete overstory removal may be detrimental to existing seedlings of *Picea* and *Abies*. Also, attempts to regenerate trees other than *Pinus contorta* may assume considerable risk. In the *CARU* phase, coverages of *Calamagrostis* may impede tree regeneration unless there is some site preparation. In the *PIAL* phase, timber production is low and regeneration is slow and irregular. Forage production is low on most sites because of short growing season, low numbers of forage species, and shade of the tree canopy. This h.t. often has high watershed value because of heavy annual snowpacks, especially in the *PIAL* phase.

Other studies.—This widespread h.t. has been described in several studies. Cooper (1975) and Henderson and others (1976 unpubl.) have recorded it within the study area and a portion of Reed's (1969, 1976) *Picea engelmannii/Vaccinium scoparium* h.t. also conforms to our description of *ABLA/VASC*. In surrounding areas, *ABLA/VASC* has been reported in the Uinta Mountains of Utah (Pfister 1972a; Henderson and others 1977 unpubl.), the Medicine Bow (Wirsing and Alexander 1975) and Bighorn Mountains of Wyoming (Hoffman and Alexander 1976) and in Montana (Pfister and others 1977). It also occurs in New Mexico and Arizona (Moir and Ludwig 1979), the Front Range of Colorado (Marr 1961; Moir 1969), northwestern Colorado (Hoffman and Alexander 1980), central Idaho (Steele and others 1981), and eastern Washington (Daubenmire and Daubenmire 1968). Similar communities also occur in eastern Oregon (Hall 1973).

Abies lasiocarpa/Arnica latifolia h.t. (*ABLA/ARLA*; subalpine fir/mountain arnica)



Distribution.—The *ABLA/ARLA* h.t. occurs extensively in the Bear River Mountains of southeastern Idaho and adjacent Utah; small areas appear sporadically northward to Yellowstone Park. It ranges from 2 255 to 2 835 m (7,400 to 9,300 feet) and occupies gentle to moderate terrain on all but southerly aspects. It usually appears at mid- to upper elevations of the *Abies lasiocarpa* series and seems to occupy sites where *ABLA/VASC* would occur if *Vaccinium scoparium* were present in the area. Since the *ABLA/VASC* h.t. is absent throughout most of southeastern Idaho and adjacent Utah (Henderson and others 1976 unpubl.), it appears that the *ABLA/ARLA* h.t. is a geographic replacement of *ABLA/VASC* in that area.

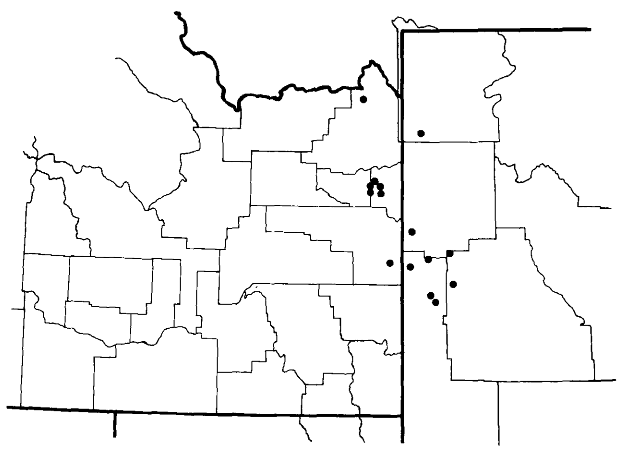
Vegetation.—*Picea engelmannii* is the major seral species throughout the h.t. and usually codominates with *Abies lasiocarpa* in old-growth stands. In portions of this h.t., *Pseudotsuga* and occasionally *Pinus contorta* or *P. albicaulis* may be present. *Ribes montigenum* and *Pachistima* are the most common shrubs and occasionally they dominate the undergrowth. Usually *Arnica latifolia* dominates a forb layer that includes *Aster engelmannii* and *Pedicularis racemosa*. *Arnica latifolia* is often difficult to distinguish from *A. cordifolia* (see taxonomic considerations) and a taxonomic key should be consulted for positive identification.

Soils.—Limited data suggest that soil parent materials included sandstone, quartzite, and andesite. Limited pH data ranged from 5.0 to 5.7 and averaged 5.3. Coverage of bare rock was usually less than 4 percent, but large boulders occurred on some sites and sometimes occupied much of the area. Amounts of bare soil were usually negligible. Average litter depth on a site reached 8 cm (3.1 in).

Productivity/Management.—Timber productivity potential is mostly moderate (appendix E-2). *Picea* grows well on these sites, but successful regeneration may require site preparation and partial shade. *Abies lasiocarpa* seedlings may require the protection of a tree canopy. When present, *Pseudotsuga* or *Pinus contorta* should regenerate easily in unshaded openings. Domestic livestock that feed in adjacent areas may seek shade and shelter on these sites and pose a threat to conifer seedlings. Benefits to big game appear limited to cover.

Other studies.—The *ABLA/ARLA* h.t. was previously described by Henderson and others (1976 unpubl.) in southeastern Idaho and adjacent Utah but has not been reported in any other studies.

Abies lasiocarpa/Symphoricarpos albus h.t. (*ABLA/SYAL*; subalpine fir/common snowberry)



Distribution.—*ABLA/SYAL* is a minor h.t. found mainly in lower drainages of the Greys and Hoback Rivers and in the Snake River Range. It also occurs in the Big Hole Mountains west of Driggs, Idaho, and occasionally northward. This h.t. ranges from 1 737 to 2 316 m (5,700 to 7,600 feet) and occupies benches, lower slopes, and well-drained alluvial terraces. It appears at low elevations of the *Abies lasiocarpa* zone where it often borders the *ABLA/PHMA* h.t. or the *Pseudotsuga* series on warmer sites. Adjacent cool, moist sites are often *ABLA/ACGL* or *ABLA/VAGL*.

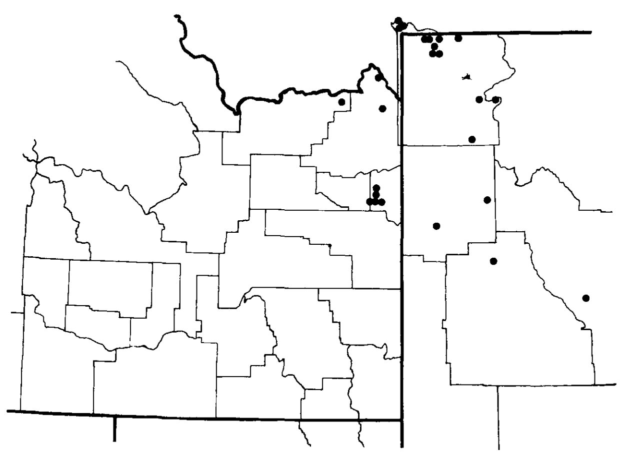
Vegetation.—*Pinus contorta* and *Pseudotsuga* are the major seral conifers; occasionally *Picea engelmannii* is a codominant. Sometimes *Populus tremuloides* is present. *Abies lasiocarpa* may be well represented even in seral stands and codominant with *Pinus contorta* and *Pseudotsuga. Amelanchier alnifolia* often forms a notable layer, especially in seral stands. *Symphoricarpos albus* creates a light canopy throughout the stand and often overtops a layer of *Calamagrostis rubescens*.

Soils.—Soil parent materials were mainly sandstone and occasionally limestone or andesite. The pH ranged from 4.8 to 6.9 and averaged 6.0. Areas of bare rock and bare soil were negligible and average litter depth per site reached 8 cm (3.1 in).

Productivity/Management.—Timber potential ranges from low to high (appendix E-2). Both *Pseudotsuga* and *Pinus contorta* should regenerate easily where the tree canopy has been removed. *Abies* may establish without site treatment but its stocking is apt to be low. Site preparations may be needed when high coverages of graminoids are present. Wintering big game may use these sites extensively because of the gentle terrain and relatively low elevations. Some animals often reduce considerably the palatable browse species. Moose, especially, may retard succession to *Abies lasiocarpa* by destroying the *Abies* regeneration.

Other studies.—This h.t. has not been described in other studies.

Abies lasiocarpa/Thalictrum occidentale h.t. (*ABLA/THOC*; subalpine fir/western meadow-rue)



Distribution.—*ABLA/THOC* is a minor h.t. that occurs mainly from Yellowstone National Park southward into the Wind River Range. It ranges from about 2 316 to 2 713 m (7,600 to 8,900 feet) and occupies gentle to moderately steep terrain on various aspects. It usually represents mid-elevations of the subalpine fir series.

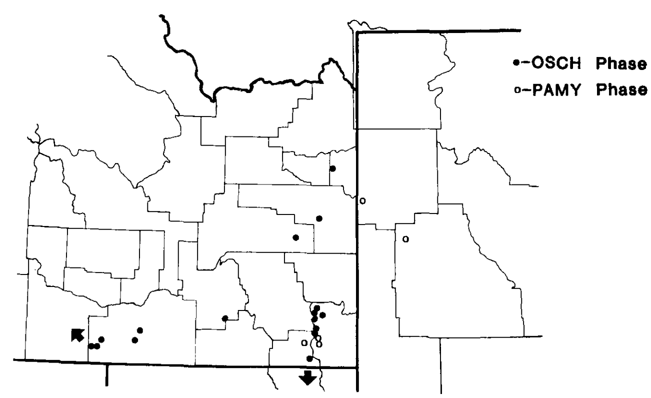
Vegetation.—*Pinus contorta* and *Picea engelmannii* are the most common seral dominants. Occasionally *Pseudotsuga* dominates seral stands and *Pinus albicaulis* may be present in small amounts. Usually *Abies lasiocarpa* regenerates heavily beneath the canopy of seral trees. Although several shrub species may be present, forbs generally dominate the undergrowth. Of these forbs, *Thalictrum occidentale, Arnica cordifolia* and *Osmorhiza chilensis* are the most common. *T. occidentale* is difficult to distinguish from a few other species of *Thalictrum* (see taxonomic considerations) and a taxonomic key should be consulted for positive identification.

Soils.—Limited soils data suggest that parent materials may be sandstone, limestone, or quartzite. The pH ranged from 5.1 to 7.0 and averaged 6.1. Areas of bare rock and bare soil were negligible and average litter depth per site reached 5 cm (2 in).

Productivity/Management.—Timber potentials are moderate (appendix E-2). If present, *Pinus contorta* or *Pseudotsuga* should regenerate well in openings. A partial tree canopy may benefit *Picea* and *Abies* seedlings by providing protection from wind and intense sunlight. Big game may seek these sites for the numerous forbs but most of this use would occur during the growing season.

Other studies.—A slightly broader version of this h.t. was described by Cooper (1975) within our study area. No other studies have reported an *ABLA/THOC* h.t.

Abies lasiocarpa/Osmorhiza chilensis h.t. (*ABLA/OSCH*; subalpine fir/mountain sweetroot)



Distribution.—*ABLA/OSCH* is a major h.t. across the southern portion of Idaho and southward into Utah. It ranges from about 1 981 to 2 591 m (6,500 to 8,500 feet) and is most common on northerly to easterly aspects. Usually it represents low to mid-elevations of the *Abies lasiocarpa* series. Adjacent drier sites are often *ABLA/CARU* or nonforest h.t.'s.

Figure 19.—*Abies lasiocarpa/Osmorhiza chilensis* h.t., *Pachistima* phase on an easterly slope in the Eightmile Creek drainage, Bear River Range (2 057 m, 6,750 feet). *Pseudotsuga*, and *Abies* are replacing a stand of *Populus tremuloides* and *Pinus contorta*. *Pachistima* has formed a prominent shrub layer. *Osmorhiza, Arnica, Geranium viscosissimum* and *Calamagrostis rubescens* are the major herbaceous species.

Vegetation.—Although *Populus tremuloides* or *Pinus contorta* may dominate early seral conditions (fig. 19), *Pseudotsuga* is the common seral dominant in most of the h.t. *Abies lasiocarpa* may codominate the site with *Pseudotsuga or Pinus contorta* or form pure stands on sites previously occupied by *Populus tremuloides*. Shrubs other than *Berberis* and *Pachistima* are usually sparse. *Osmorhiza chilensis* or *O. depauperata* are usually a dominant member of a diverse forb layer. Other species characterize the two phases noted below. The two species of *Osmorhiza* are often difficult to distinguish (see taxonomic considerations) but are similar enough in their ecologies to be used as alternate indicators.

Pachistima myrsinites (*PAMY*) phase.—This phase occurs mainly in the Bear River Range and occasionally to the northeast. It ranges from 1 981 to 2 591 m (6,500 to 8,500 feet). *Pachistima* usually dominates the undergrowth; *Osmorhiza depauperata* is a codominant in most forb layers. Other species common to this phase include *Aquilegia coerulea* and *Aster engelmannii*.

Osmorhiza chilensis (*OSCH*) phase.—This phase occurs mainly in the Bear River Range and westward between 2 012 and 2 499 m (6,600 and 8,200 feet). *Osmorhiza chilensis* is often a dominant forb here (fig. 20); frequent associates are *Silene menziesii, Thalictrum fendleri*, and *Viola adunca*.

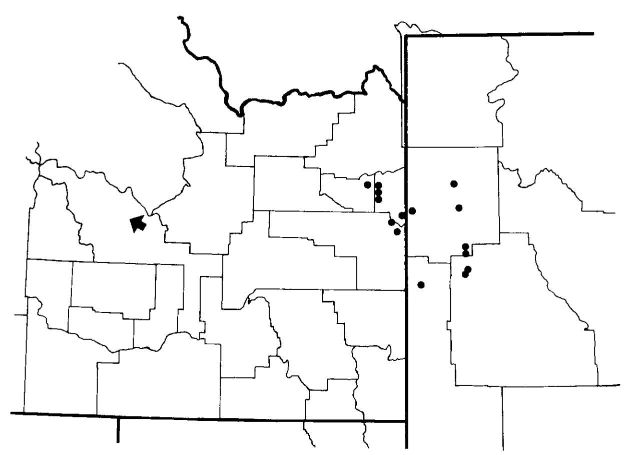
Figure 20.—*Abies lasiocarpa/Osmorhiza chilensis* h.t., *Osmorhiza* phase on a north toeslope in the Eightmile Creek drainage, Bear River Range (2 225 m, 7,300 feet). All-age *Abies* is replacing an overstory of *Pseudotsuga. Osmorhiza* dominates a diverse undergrowth layer.

Soils.—Soil parent materials included shale, limestone, sandstone, quartzite, and dacite. The pH ranged from 5.5 to 7.2 and averaged 6.1. Areas of bare rock or bare soil rarely exceeded 5 percent. Average litter depth on a site seldom exceeded 6.5 cm (2.6 in).

Productivity/Management.—Timber productivity appears moderate to high (appendix E-2). Seral conifers should regenerate easily in small openings. *Abies lasiocarpa* can regenerate beneath the canopy of seral trees and is fairly productive (appendix E-1). Complete removal of the overstory can result in a *Populus tremuloides* community that will persist until replaced by conifers. Shrubs in adjacent nonforest communities, such as *Amelanchier, Prunus, Symphoricarpos*, and *Artemisia*, may also invade large clearcuts. Forage production is limited mainly to forbs that can thrive beneath a light canopy of *Populus tremuloides*.

Other studies.—The *ABLA/OSCH* h.t. has been described from the southern Sawtooth National Forest (Steele and others 1974 unpubl.) and the Caribou National Forest (Henderson and others 1976 unpubl.). It has not been reported in studies of other areas.

Abies lasiocarpa/Spiraea betulifolia h.t. (*ABLA/SPBE;* subalpine fir/white spirea)



Distribution.—*ABLA/SPBE* is a minor h.t. in the Hoback and Greys River drainages and in the Snake River Range. It also is found in central Idaho. It occurs from 2 042 to 2 316 m (6,700 to 7,600 feet) and represents low to mid-elevations of the *Abies lasiocarpa* series. Usually it occupies westerly to southerly aspects on steep to gentle slopes. *ABLA/SPBE* may border *ABLA/CARU* or *PSME/SPBE* h.t.s on drier sites and *ABLA/VAGL* or *ABLA/ACRU* h.t.s on wetter sites.

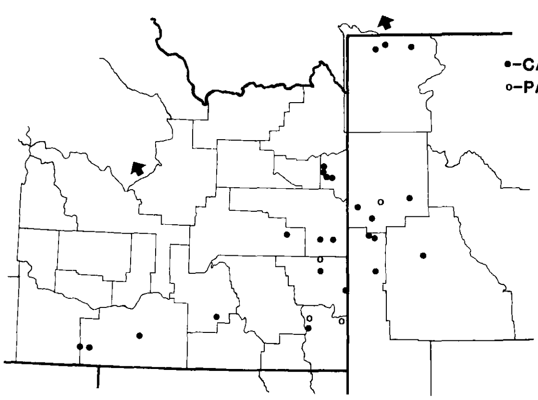
Vegetation.—*Pinus contorta* and *Pseudotsuga* usually dominate seral stands, with *Pseudotsuga* being the more frequent dominant. *Picea engelmannii* may be present in lesser amounts. In most stands, *Abies lasiocarpa* dominates the tree understory. *Amelanchier, Berberis, Sorbus*, and *Lonicera utahensis* are common shrubs here but seldom have high coverages. *Pachistima* is often present and may codominate the shrub layer with *Spiraea*.

Soils.—Soils were derived mainly from sandstone and occasionally limestone or granitics. The pH ranged from 5.3 to 6.4 and averaged 6.0. Usually areas of bare rock and bare soil were nil, but a few sites had boulders that occupy a major portion of the area. Average litter depth on a site reached 4 cm (1.6 in).

Productivity/Management.—Timber productivity potentials are mostly low to moderate (appendix E-2). *Pinus contorta* and *Pseudotsuga* should regenerate easily on seedbeds that receive ample sunlight. If present, *Picea* seedlings may prefer smaller openings that afford some site protection. In most stands, removal of the seral trees without site preparation will hasten succession toward dominance of *Abies lasiocarpa*. Big game seek food and shelter here throughout much of the summer and fall, but domestic livestock are seldom attracted to these sites.

Other studies.—Within the study area this h.t. conforms to portions of Cooper's (1975) *ABLA/VAGL* h.t., *SPBE* phase. *ABLA/SPBE* also occurs in central Idaho (Steele and others 1981) where it lacks *Pachistima* and *Picea*.

Abies lasiocarpa/Calamagrostis rubescens h.t. (*ABLA/CARU*; subalpine fir/pinegrass)



Distribution.—In the study area, *ABLA/CARU* occurs as a major h.t. from about the latitude of Driggs, Idaho, southward. It also occurs in south-central Montana, the adjacent portions of Yellowstone Park and in central Idaho. It is notably absent from much of the Absaroka and Wind River Ranges. This h.t. occupies a variety of aspects on gentle to moderate slopes between 1 859 to 2 591 m (6,100 to 8,500 feet) and represents low to mid-elevations of the *Abies lasiocarpa* series.

Vegetation.—*Pinus contorta* and *Pseudotsuga* are the common seral dominants. *Abies lasiocarpa* usually dominates the understory (fig. 21). *Calamagrostis rubescens*, often accompanied by *Carex geyeri*, creates a conspicuous layer in the undergrowth and shrubs other than *Pachistima* are usually sparse. Forbs such as *Arnica, Geranium*, and *Aster* are generally sparse on undisturbed sites but may be abundant in seral stands.

Pachistima myrsinites (*PAMY*) phase.—This phase appears intermittently throughout southeastern Idaho and adjacent Wyoming where it ranges from 1 981 to 2 499 m (6,500 to 8,200 feet). *Pseudotsuga* is a consistent seral dominant, with *Pinus contorta* appearing less frequently. *Pachistima* usually accompanied by *Berberis repens* forms a layer above the *Calamagrostis*.

Calamagrostis rubescens (*CARU*) phase.—This is the common phase throughout the range of the h.t. In our area, it occurs from 1 737 to 2 377 m (5,700 to 7,800 feet). *Pinus contorta* is the common seral dominant, with *Pseudotsuga* appearing less frequently. Shrubs are generally sparse. *Arnica cordifolia* and *Viola adunca* are the most common forbs.

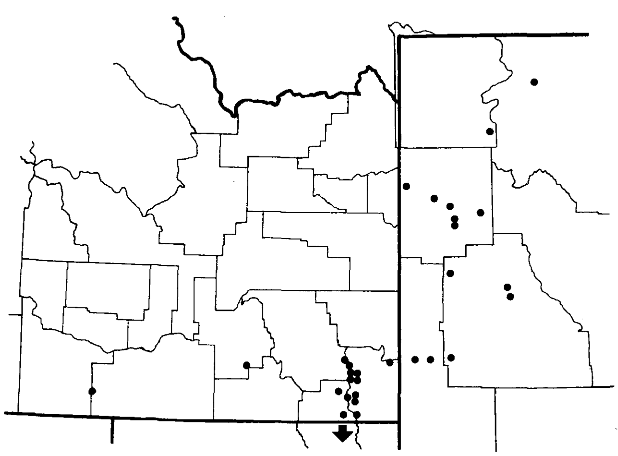
Soils.—Soil parent materials were mainly sandstone. The pH ranged from 4.9 to 6.2 and averaged 5.8. Areas of bare rock or bare soil were usually less than 3 percent. Average litter depth seldom exceeded 7 cm (2.8 in).

Productivity/Management.—Timber productivity potential is low to moderate (appendix E-2). In the *CARU* phase, *Pinus contorta* is the most dependable species for timber production and normally regenerates wherever there is a suitable seedbed with ample sunlight. In the *PAMY* phase, *Pseudotsuga* may be the best suited species for timber management even though regeneration may be difficult to attain. If the overstory is removed, the *Calamagrostis* may increase rapidly and retard seedling establishment. Livestock make light use of this h.t. but are attracted to recent clearings where the forbs and graminoids have acquired renewed vigor. Here the animals may congregate and trample tree seedlings. Big game, especially elk, will feed on the graminoids present. Seral stands may produce some shrubs and forbs with high forage value.

Figure 21.—*Abies lasiocarpa/Calamagrostis rubescens* h.t., *Calamagrostis* phase on a gentle north slope in the McCoy Creek drainage of the Caribou Range (1 905 m, 6,250 feet). *Pinus contorta* dominates an understory of *Abies*. *Calamagrostis* clearly dominates the undergrowth.

Other studies.—The *ABLA/CARU* h.t. was previously described in the study area by Henderson and others (1976 unpubl.). It is also reported from Montana (Pfister and others 1977) and central Idaho (Steele and others 1981).

Abies lasiocarpa/Berberis repens h.t. (*ABLA/BERE*; subalpine fir/Oregon grape)



Distribution.—*ABLA/BERE* is a major h.t. throughout much of Utah and extends northward into southeastern Idaho and western Wyoming. It ranges from 2 012 to 2 713 m (6,600 to 8,900 feet) and usually appears at low to mid-elevations of the *Abies lasiocarpa* series. Usually adjacent warmer sites are in the *Pseudotsuga* series. Although this h.t. occurs on a variety of sites, it is most common on moderate slopes having northerly aspects.

Vegetation.—Usually *Pseudotsuga* dominates seral stands. *Picea* may be present in lesser amounts and occasionally is dominant. In some areas *Populus tremuloides* or *Pinus contorta* will dominate early successional stages. *Abies lasiocarpa* is normally well represented, at least in the smaller size classes. Usually *Pachistima* dominates the undergrowth and is accompanied by *Berberis repens*, but occasionally one or the other is absent. Other common shrubs are *Symphoricarpos oreophilus*, *Shepherdia*, and *Amelanchier*. *Arnica cordifolia* is the most common forb and often has high coverages. The moss, *Brachythecium collinum*, also appeared frequently in this h.t.

Carex geyeri (*CAGE*) phase.—This incidental phase occurs locally from 2 377 to 2 652 m (7,800 to 8,700 feet) in the Bear River Range of southeastern Idaho and becomes more common in northern Utah. *Carex geyeri* which may occur in high coverages is the characteristic feature. This phase appears to be closely related to the *ABLA/CAGE* h.t.

Berberis repens (*BERE*) phase.—This is the common phase found in the study area. Its description generally follows that given for the h.t.

Soils.—Soil parent materials included sandstone, limestone, granitics, quartzite, shale, and basalt. Soil pH ranged from 4.6 to 7.1 and averaged 5.8. Coverage of bare rock was usually less than 5 percent, but in some areas large boulders covered much of the site. Areas of bare soil were generally less than 3 percent. Average litter depth on a site seldom exceeded 7 cm (2.8 in).

Productivity/Management.—Timber productivity ranges from low to high (appendix E-2). *Pinus contorta* or *Pseudotsuga* should regenerate easily on seedbeds that receive ample sunlight. If *Populus tremuloides* is present it can often dominate newly made openings in the stand. *Picea*, if present, and *Abies* should establish easily beneath a light canopy of existing conifers and grow well if free of suppression. Domestic livestock seldom spend much time on these sites but deer may use some areas throughout the summer.

Other studies.—Pfister (1972a) first described the *ABLA/BERE* h.t. in Utah and later Henderson and others (1976 unpubl.; 1977 unpubl.) recognized it in southeastern Idaho. No other studies have reported this h.t.

Abies lasiocarpa/Carex geyeri h.t. (*ABLA/CAGE*; subalpine fir/elk sedge)

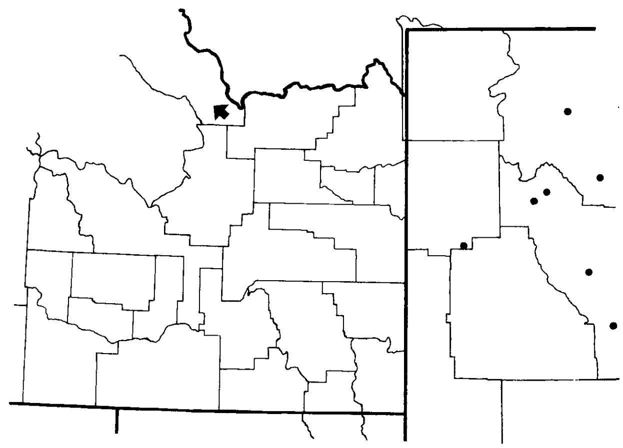
Distribution.—This incidental h.t. occurs in Yellowstone National Park and occasionally southward to the Bear River Range in southeastern Idaho. It appears mainly between 2 377 to 2 896 m (7,800 and 9,500 feet) at mid- to upper elevations of the subalpine fir series.

Vegetation.—*Pinus contorta* is the common seral dominant and small amounts of *Picea* or *Pseudotsuga* are sometimes present. *Pinus albicaulis* appears sporadically throughout the h.t. and becomes increasingly abundant toward the cold extreme. Usually *Carex geyeri* dominates the undergrowth among the sparse layer of forbs. Shrubs are generally scarce.

Productivity/Management.—Data from other studies noted below suggest that timber potentials are low to moderate. *Pinus contorta*, if present, is the only practical species for regeneration. Livestock and big game find little forage here except *Carex geyeri*, which is used by cattle and elk.

Other studies.—*ABLA/CAGE* typically occurs on the coarse granitic soils in central Idaho where a *Carex geyeri* phase and an *Artemisia tridentata* phase are described (Steele and others 1981). Only the *Carex geyeri* phase is known from our area. *ABLA/CAGE* also occurs in Montana (Pfister and others 1977) where an additional *Pseudotsuga menziesii* phase is described; however, most stands in this phase appear to fit our *ABLA/THOC* h.t. *ABLA/CAGE* is also reported from southeastern Wyoming (Wirsing and Alexander 1975). Hoffman and Alexander (1980) report *ABLA/CAGE* in northwestern Colorado, but some of their stands (54 and 29) fit our *ABLA/VASC* and a few others (7, 68, 61) fall within *ABLA/CARU*.

Abies lasiocarpa/Juniperus communis h.t. (*ABLA/JUCO*; subalpine fir/common juniper)



Distribution.—In our area, *ABLA/JUCO* is a minor h.t. along eastern slopes of the Absaroka and Wind River Ranges. It also appears in east-central Idaho. This h.t. occurs mainly on gentle slopes from 2 408 to 2 865 m (7,900 to 9,400 feet) but will also appear in cold air drainages as low as 1 981 m (6,500 feet).

Vegetation.—*Pinus contorta, Picea*, and *Pseudotsuga* are the major seral conifers. Lesser amounts of *Abies lasiocarpa* often codominate with these species in older stands. Large, widely spaced patches of *Juniperus communis* create the dominant aspect in the undergrowth. *Shepherdia* is often present and occasionally has high coverages, especially in younger stands. *Arnica cordifolia* usually dominates the forb layer, which is often quite depauperate.

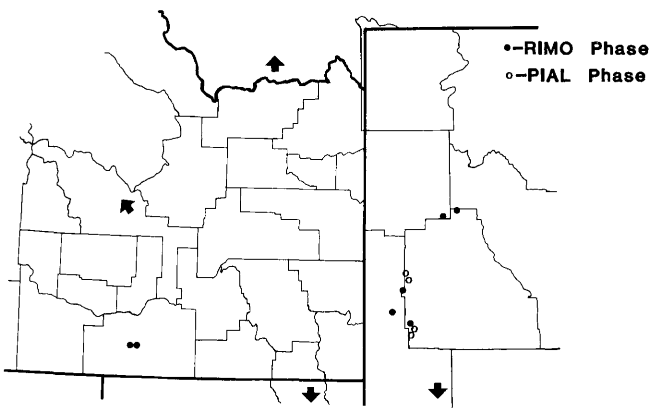
Soils.—The soils were derived mainly from granitics and sandstone and occasionally from shale, andesite, and limestone. The pH ranged from 5.2 to 6.9 and averaged 5.9. Areas of bare rock or bare soil seldom exceeded 5 percent. Average litter depth on a site seldom exceeded 5 cm (2 in).

Productivity/Management.—Timber potentials are low to moderate (appendix E-2). When *Pinus contorta* is present it should establish in clearings that receive full sunlight. Other conifers should establish best under partial shade. Substrate also influences success of the seral tree species. *Pseudotsuga* and *Picea* grow reasonably well on calcareous substrates where *Pinus contorta* does poorly. *Pseudotsuga* is not apt to succeed on sandstone or granitic material.

Livestock find little forage here and seldom use these sites unless grazing areas are nearby. These sites provide cover for deer, elk, and moose that feed in nearby areas. Moose also browse the *Abies* in this h.t.

Other studies.—*ABLA/JUCO* also occurs in central Idaho (Steele and others 1981) where it is more prevalent. A similar condition occurs in Arizona and New Mexico (Moir and Ludwig 1979).

Abies lasiocarpa/Ribes montigenum h.t. (*ABLA/RIMO;* subalpine fir/mountain gooseberry)



Distribution.—*ABLA/RIMO* is a minor h.t. that extends across the study area from Utah to Montana and central Idaho. It appears at upper elevations of the forested zone and seldom occurs below 2 438 m (8,000 feet). It may occupy various slopes and aspects.

Vegetation.—Tree cover varies according to the phases noted below. Undergrowths are often quite depauperate, with *Ribes montigenum* being the only conspicuous shrub. Occasionally the *Ribes* will form a dense layer but more often it occurs in small clumps.

Pinus albicaulis (*PIAL*) phase.—The *PIAL* phase was found along the crest of the Wyoming Range between 2 950 and 3 109 m (9,680 and 10,200 feet). It represents the upper extremes of the *ABLA/RIMO* h.t. and usually merges with alpine communities. Its lower limits border the *ABLA/VASC* h.t., *PIAL* phase, *ABLA/ARLA* or *ABLA/RIMO* h.t., *RIMO* phase. *Pinus albicaulis* is well represented and usually the dominant tree. Stunted *Abies*, and occasionally *Picea*, occur beneath the pine. This phase was recently discovered by Andrew Youngblood (Bridger-Teton National Forest, pers. comm.) who supplied the existing data.

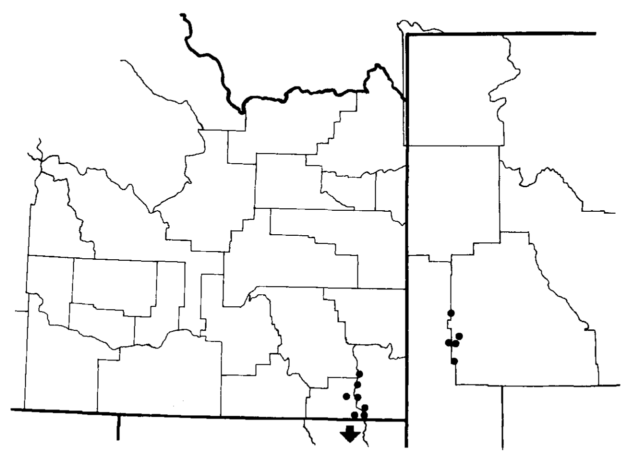
Ribes montigenum (*RIMO*) phase.—This is the more common phase of the *ABLA/RIMO* h.t. and usually occurs between 2 560 and 2 774 m (8,400 and 9,100 feet). *Picea engelmannii* is the major seral species, although *Pinus contorta* is occasionally present (fig. 22). *Pinus albicaulis* may appear in minor amounts. *Abies lasiocarpa* may solely dominate old growth stands or codominate with *Picea*.

Soil.—Soil parent materials were mainly sandstone, and other sedimentaries, but included granitics and quartzite. The pH ranged from 4.0 to 5.4 and averaged 4.8. Areas of bare rock were usually less than 2 percent, but on some sites scattered boulders substantially increased the rock coverage. Areas of bare soil were usually less than 5 percent. Average litter depth per site reached 10 cm (3.9 in).

Productivity/Management.—Timber potential in the *PIAL* phase is nil. In the *RIMO* phase, timber productivity is mostly low to moderate (appendix E-2) and tree regeneration may be sporadic. *Picea* and *Abies* should regenerate best where they receive protection from frost heaving and intense insolation. In southern Utah (Pfister 1972b) it was shown that trees have difficulty getting established in clearcuts because of the severe environment within this h.t. Billings (1969) has described a harsh microclimate on sites resembling *ABLA/RIMO*. Big game and livestock may seek shelter on these sites but find little forage here. Snowpacks persist late into the growing season and provide summer runoff, which may be the most valuable resource.

Other studies.—Pfister (1972a) first described the *ABLA/RIMO* h.t. in Utah. It was later reported from central Idaho (Steele and others 1981), adjacent Montana (Pfister and others 1977), and southeastern Idaho (Henderson and others 1976 unpubl.).

Abies lasiocarpa/Pedicularis racemosa h.t. (*ABLA/PERA;* subalpine fir/pedicularis)



Distribution.—This h.t. occurs mainly in southeastern Idaho and adjacent Wyoming and extends southward into Utah. It ranges from 2 255 to 2 621 m (7,400 to 8,600 feet) and occupies a variety of aspects on gentle to moderately steep terrain. It normally represents mid-elevations of the *Abies lasiocarpa* series.

Vegetation.—*Pinus contorta, Picea*, and sometimes *Pseudotsuga*, are the major seral trees. *Abies lasiocarpa* usually dominates the tree understory. *Symphoricarpos oreophilus* and *Pachistima myrsinites* are common shrubs here, but they usually have low coverages. *Pedicularis*

Figure 22.—*Abies lasiocarpa/Ribes montigenum* h.t., *Ribes* phase on a northeast slope near Commissary Ridge, in the Salt River Range (2 743 m, 9,000 feet). *Picea* and *Abies* dominate an understory of *Abies. Ribes montigenum* has formed small patches throughout the stand. The herbaceous layer has numerous species but their coverages are all quite low.

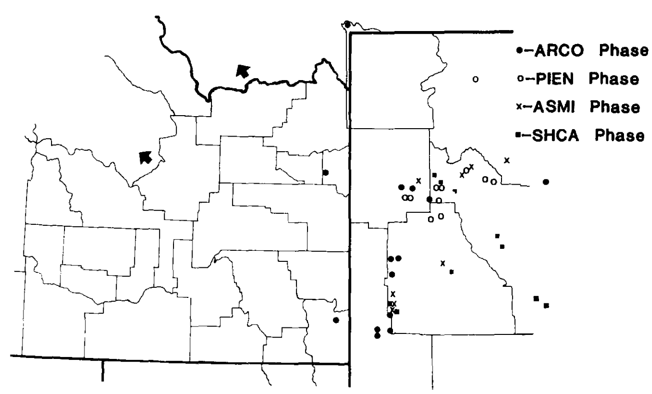
racemosa is common throughout the stand and often dominates the forb layer (fig. 23). Normally, *Arnica cordifolia* is the only other forb with a relatively high coverage and *Aster engelmannii* is usually present.

Soils.—Soils were derived mainly from sandstone and limestone. The pH ranged from 4.6 to 7.1 and averaged 5.6. Areas of bare rock were usually less than 5 percent and bare soil less than 1 percent. Average litter depth on a site reached 8 cm (3.1 in).

Productivity/Management.—Timber potentials range from low to high but are mostly moderate (appendix E-2). *Pinus contorta* grows well here on noncalcareous substrates and should establish easily where competing vegetation is removed. On calcareous substrates, *Picea* and sometimes *Pseudotsuga* should establish in small openings or in partial shade. Overstory removal without site preparation may accelerate succession toward dominance of *Abies*.

Other studies.—The *ABLA/PERA* h.t. was first described by Henderson and others (1976 unpubl.) It has not been mentioned in other studies.

Abies lasiocarpa/Arnica cordifolia h.t. (*ABLA/ARCO*; subalpine fir/heartleaf arnica)



Distribution.—*ABLA/ARCO* is most common in the eastern (continental climate) portion of the study area and occurs in similar areas of east-central Idaho and Montana. In the study area, it is a major h.t. on eastern slopes of the

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Figure 23.—*Abies lasiocarpa/Pedicularis racemosa* h.t. on a gentle northwest slope near Middle Piney Lake, Wyoming Range (2 530 m, 8,300 feet). A mixed stand of *Picea*, *Pseudotsuga*, and *Abies* dominates the site. *Pedicularis racemosa* is the prominent forb of a rather sparse undergrowth.

Wind River, Wyoming, and Absaroka Ranges. It occurs from 2 255 to 2 896 m (7,400 to 9,500 feet) and represents low to mid-elevations of the *Abies lasiocarpa* series. *ABLA/ARCO* can be found on most aspects having gentle to moderate terrain. In a southerly direction along the Wyoming Range the climate becomes progressively drier and *ABLA/ARCO* shifts from south slopes with *ABLA/VASC* on north exposures to north slopes with sage-grass communities on south exposures (Andrew Youngblood, Bridger-Teton National Forest, pers. comm.). Many widespread h.t.'s shift their topographic positions geographically but seldom in such a short distance.

Vegetation.—*Pinus contorta* is usually the dominant seral species but sometimes *Picea* or *Pseudotsuga* is also present. In some areas the *Pseudotsuga* is present only on limestone parent material where *Pinus contorta* is absent. Amounts of *Abies lasiocarpa* vary from codominance with the seral conifers to widely scattered individuals. Shrubs, except *Shepherdia*, are usually sparse. *Arnica cordifolia* generally dominates or codominates a light forb layer.

Astragalus miser (*ASMI*) phase.—This phase occurs mainly from 2 469 to 2 682 m (8,100 to 8,800 feet) on easterly to southerly aspects. *Pinus contorta* is the dominant seral tree and *Picea* is occasionally present in lesser amounts (fig. 24). *Astragalus miser* usually codominates the undergrowth with *Arnica*.

Shepherdia canadensis (*SHCA*) phase.—The *SHCA* phase occurs mainly in the Wind River Range between 2 255 and 2 652 m (7,400 and 8,700 feet). It appears mostly on easterly to northerly aspects on sandstone or granitic parent materials. *Pinus contorta* dominates seral stands and *Pseudotsuga* appears more often here than in the other phases but in lesser amounts. *Shepherdia canadensis* usually dominates the undergrowth even though its coverage gradually decreases toward climax (fig. 25). Succession progresses so slowly on these sites that one can only speculate if *Shepherdia* will persist in the climax stand.

Picea engelmannii (*PIEN*) phase.—This phase appears between 2 316 and 2 896 m (7,600 and 9,500 feet) on moderately steep slopes having northerly aspects. *Pinus contorta* is followed by persistent stands of *Picea* (fig. 26). This is the only phase of *ABLA/ARCO* in our area where *Picea* is a major seral species. As opposed to the other phases, high coverages of moss, mainly *Hypnum rev-*

Figure 24.—*Abies lasiocarpa/Arnica cordifolia* h.t., *Astragalus* phase on a northeast slope near Frontier Creek, southern end of Absaroka Range (2 499 m, 8,200 feet). *Pinus contorta* dominates an undergrowth of *Abies. Astragalus* and *Lupinus* are the prominent forbs.

Figure 25.—*Abies lasiocarpa/Arnica cordifolia* h.t., *Shepherdia* phase on a north slope in the Wind River Range northeast of Pinedale, Wyo. (2 518 m, 8,260 feet). *Pinus contorta* dominates the site; *Abies* and *P. albicaulis* are present but sparse. *Shepherdia* is the only undergrowth species having a significant coverage.

Figure 26.—*Abies lasiocarpa/Arnica cordifolia* h.t., *Picea* phase on a steep north slope near Cartridge Creek, southern end of Absaroka Range (2 560 m, 8,400 feet). Large *Picea* dominate an understory of *Abies*. The dead fallen trees are *Pinus contorta*. *Arnica* dominates a depauperate herbaceous layer. The moss, *Hypnum revolutum* is well represented in the cryptogam layer.

Figure 27.—*Abies lasiocarpa/Arnica cordifolia* h.t., *Arnica* phase on a gentle west slope in the Hams Fork drainage east of Border, Wyo. (2 484 m, 8,150 feet). *Pinus contorta* dominates an understory of young *Abies*. *Arnica* clearly dominates a depauperate undergrowth.

olutum, are common on these sites. As a result, this phase may resemble the *Picea/Hyre* h.t. in terms of undergrowth as well as topographic position.

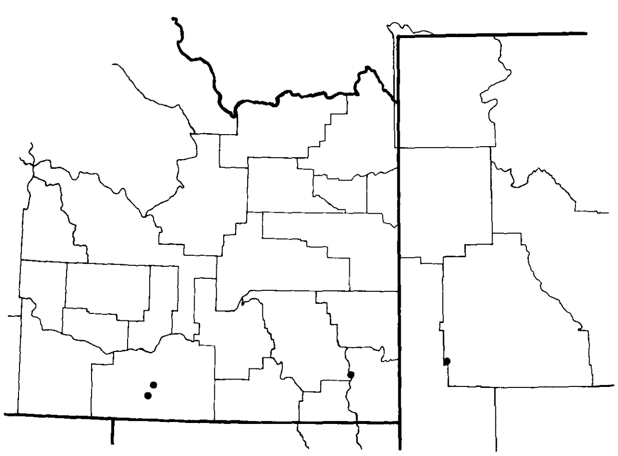
Arnica cordifolia (*ARCO*) phase.—The *ARCO* phase occurs throughout the range of the h.t. from 2 377 to 2 926 m (7,800 to 9,600 feet). It appears on various aspects and follows the general description of the h.t. (fig. 27).

Soils.—Soil parent materials were mainly sandstone, granitics, and quartzite but also include shale, andesite, and occasionally limestone. The pH ranged from 4.1 to 7.1 and averaged 5.5. Areas of bare rock or bare soil were usually less than 2 percent. Average litter depth on a site seldom exceeded 5 cm (2 in). These characteristics differed only slightly between phases.

Productivity/Management.—Timber productivity in most of the type ranges from low to moderate, but some sites in the *ARCO* phase have high potentials (appendix E-2). *Pinus contorta* should establish easily where competing vegetation is removed. It is usually the only suitable timber species except in the *PIEN* phase, where *Picea* should regenerate under a partial tree canopy. In the *SHCA* phase, *Pinus contorta* stands often appear very persistent and may be managed as if the pine were climax; repeated burning may increase the coverage of *Shepherdia*. Domestic livestock and big game find little forage on this h.t., but use the sites for shelter or hiding cover.

Other studies.—The *ABLA/ARCO* h.t. was originally described in Montana (Pfister and others 1977) where it includes a richer herbaceous layer than is described in other studies. *ABLA/ARCO* is also described in central Idaho (Steele and others 1981) and the Bighorn Mountains of Wyoming (Hoffman and Alexander 1976). Cooper's (1975) *Abies lasiocarpa/Thalictrum occidentale* h.t., *Arnica cordifolia* phase relates to our *ABLA/ARCO* h.t.

Abies lasiocarpa/Carex rossii h.t. (*ABLA/CARO*; subalpine fir/Ross sedge)



Distribution.—*ABLA/CARO* is a minor h.t. near the Idaho-Utah border. Small amounts also appear in the Wyoming Range of Wyoming. It occurs from about 2 255 to 2 438 m (7,400 to 8,000 feet) and represents low elevations of the *Abies lasiocarpa* series. It tends to border nonforest communities at the dry extreme and the *ABLA/CARU* or *ABLA/ARCO* h.t.'s at the moist end.

Vegetation.—*Pinus contorta* is the common seral dominant. Small amounts of *Picea engelmannii, Pinus flexilis* and *Populus tremuloides* are occasionally present. In older stands, *Abies lasiocarpa* often codominates with *Pinus contorta. Carex rossii* normally dominates a very depauperate undergrowth. Shrubs are virtually absent.

Soils.—Soil parent materials consisted of quartzite and sandstone. The pH ranged from 5.3 to 6.1 and averaged 5.7. Areas of bare rock and bare soil were less than 2 percent. Average litter depth per site reached only 2 cm (0.8 in).

Productivity/Management.—Timber potentials are probably low and adequate regeneration of *Pinus contorta* may be difficult to attain on these dry sites. The root system of established *Carex rossii* presents severe competition for tree seedlings and site treatment may be needed even though *Carex* interspaces appear adequate for conifer establishment. When *Populus tremuloides* is present it can provide some browse for deer and elk, otherwise forage values are very low for big game and livestock. Animals that feed in adjacent nonforest communities may use these sites for shelter and concealment.

Other studies.—No other studies have described *ABLA/CARO*.

Pinus albicaulis Series

Distribution.—*Pinus albicaulis* h.t.'s are best represented in the rather dry Wind River Range, which is the southeastern limit of the *P. albicaulis* distribution. This series also extends northward and eastward through the Absaroka and Teton Ranges to Montana and Idaho. *Pinus albicaulis* h.t.'s extend downslope from upper timberline on dry, exposed ridges and are best developed on southern to western aspects, though they may occur on any aspect. At its cold extremes this series borders alpine communities usually dominated by *Carex* spp., *Festuca idahoensis*, or *F. ovina*. At lower elevations it merges with dry-cold h.t.'s of the *Abies, Picea*, or *Pinus contorta* series.

These sites are too severe for *Abies* or *Picea*, and even *Pinus albicaulis* is deformed or stunted by wind, cold, and drought on the most exposed sites. On severe sites, *Pinus albicaulis* often develops multistemmed forms which are more prevalent in the Yellowstone-Teton region than in areas to the southeast. On sites less severe, *P. albicaulis* extends downslope as a minor seral species to where it overlaps the highest distributions of *Pseudotsuga*. In some areas, the *P. albicaulis* distribution appears influenced by substrate. This tree occurs strongly on acidic substrates even though it has been recorded on calcareous ones (Weaver and Dale 1974; Forcella 1978; Pfister and others 1977). Its distribution is also strongly influenced by the Clarks nutcracker, which is instrumental in the pine's dispersal and establishment (Lanner 1980). This bird transports large numbers of *P. albicaulis* seed to caching areas where it deposits 1-5 seeds in the soil at a depth of 2-3 cm (0.8-1.2 in); the preferred caching sites are windswept areas that become free of snow early in the spring (Lanner and Vander Wall 1980; Lanner 1980).

Vegetation.—On exposed upper slopes and ridges, *Pinus albicaulis* is often the sole dominant. On the more gentle slopes protected from severe wind, *P. albicaulis* may co-dominate with *P. contorta* in older stands. In the relatively younger stands, *P. contorta* is often the dominant tree, with lesser amounts of *P. albicaulis* scattered throughout. For purposes of h.t. classification, these sites should be considered as part of the *P. albicaulis* series because the greater shade tolerance of *P. albicaulis* implies its eventual dominance at climax (Day 1967). Occasionally this long successional trend is accelerated by mountain pine beetles, which kill the *P. contorta* and leave *P. albicaulis* with a greater competitive advantage. An occasional *Pseudotsuga, Picea*, or *Abies* may appear in these stands, but the unfavorable substrates and harsh environments preclude their development and reproduction.

The undergrowths of closed stands are very depauperate but where stands become open, as at upper treeline or the ecotones with other vegetation, richness is increased twofold to fourfold. Undergrowths also increase beneath the more open tree canopies of older stands. *Vaccinium scoparium*, which occurs only on the best sites in this series attains an abundant coverage. Occasionally *Shepherdia* and *Juniperus communis* are well represented in certain h.t.'s. *Arnica cordifolia, Poa nervosa*, and *Carex rossii* are most characteristic of the herbaceous layer but seldom have high coverages.

Insects/Disease.—The mountain pine beetle (*Dendroctonus ponderosae*) has killed considerable *P. albicaulis* in a few localities within the study area: Sawtelle Peak, Union Pass, Togwotee Pass, and the Absaroka Range in Yellowstone National Park. Although these few instances probably do not reflect the actual degree of infestation within the study area, there was little evidence of widespread lethal attacks on *P. albicaulis* in areas where it is climax in spite of obvious attacks (sometimes devastating) on associated *P. contorta*. The white pine blister rust (*Cronartium ribicola*), which threatens survival of *P. albicaulis* in northern Idaho (Daubenmire and Daubenmire 1968), is notably scarce in most of the study area. Local infestations of white pine blister rust have occurred in Yellowstone National Park and in the Raynolds Pass and Sawtelle Peak areas to the west.

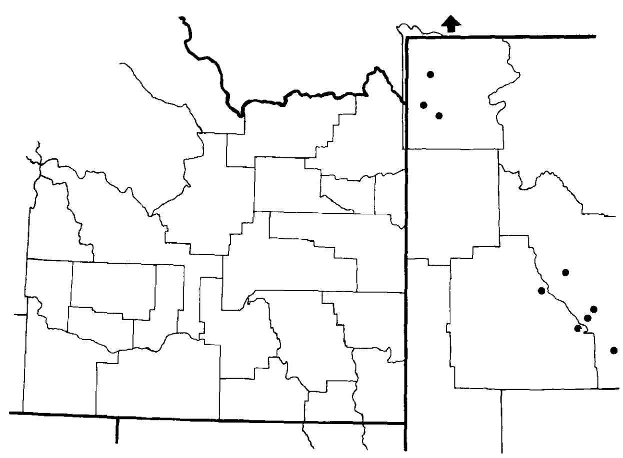
Soils.—This series occurs on soils derived from most major rock types except calcareous sedimentaries, which apparently do not support *P. albicaulis* in this area. Because granitics predominate at upper elevations of the Wind River Range, the soils of most *Pinus albicaulis* h.t.'s are coarse textured and contain relatively high percentages of coarse fraction (particles 2 mm). Other soils characteristics are best treated at the h.t. level.

Fire.—Fire frequency is high owing to the high density of lightning strikes on these exposed upper slopes and ridges. Nevertheless, the inability of fire to spread through the discontinuous canopies and meager undergrowth has enabled numerous stands to attain extreme ages (600 years), high basal areas (appendix E-2), and large biomass (Forcella and Weaver 1977).

Productivity/Management.—The highest elevation h.t.'s in this series produce virtually no commericial timber. In the lower elevation stands, *Pinus contorta* is a persistent seral dominant but is of poor form, with very low site index values. Forage production is poor to fair, even on the most moist sites. Grazing abuse can easily degrade the herb-dominated undergrowths, but where *Vaccinium scoparium* dominates, the sites appear less fragile and have been noted to sustain heavy use by deer and elk that feed in adjacent grasslands. Like the alpine communities, vegetation recovery here is slow and soil erosion can virtually preclude complete restoration. Though highly variable by year, *P. albicaulis* seed crops are sometimes large and provide nutritious forage for birds, rodents, and bears. Often the principal value of these sites is watershed protection and delayed melting of the snowpack. The considerable esthetic appeal of these sites coupled with their low undergrowth and open character has made them popular with recreationists. Unfortunately, these sites are usually fragile and degrade rapidly even when subjected to relatively low levels of recreational use.

Other Studies.—Some habitat types have been recognized and described within this series (Reed 1969; Weaver and Dale 1974; Cooper 1975; Forcella 1978). Other studies (Pfister and others 1977; Steele and others 1981) have noted a diversity of undergrowths within what was termed *Pinus albicaulis* h.t.'s. But they only described these h.t.'s at the series level because of comparably low productivity for all sites and a small data base.

Pinus albicaulis/Vaccinium scoparium h.t. (*PIAL/VASC*; whitebark pine/grouse whortleberry)



Distribution.—*PIAL/VASC* is a major h.t. in the Wind River Range and extends northward to Yellowstone National Park and into Montana. It ranges from about 2 591 to 3 200 m (8,500 to 10,500 feet) and occurs within the highest belt of subalpine forest, usually in concave landforms and other protected positions. Adjacent more severe sites may be the *PIAL/CARO* h.t. or grassland. Downslope to more moist sites, *PIAL/VASC* merges most frequently with the *ABLA/VASC* or *PIEN/VASC* h.t.'s.

Vegetation.—*Pinus contorta* is most successful at the low elevations of the h.t. It appears to be long lived on these sites and persists as a dominant or codominant with *P. albicaulis*. Toward upper elevations of the h.t., the prevalence of *P. contorta* diminishes and the replacement by *P. albicaulis* becomes stronger. Occasionally, *Picea* or *Abies lasiocarpa* are present as unthrifty specimens.

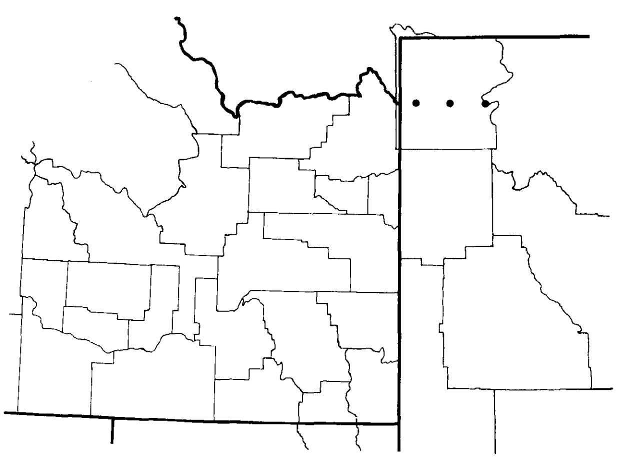
The undergrowth is typified by a layer of *Vaccinium scoparium* that generally does not attain the high coverages found at lower elevations. The shrub and herb layers are notably depauperate; only *Vaccinium scoparium, Poa nervosa, Carex rossii*, and *Arnica cordifolia* exceed 50 percent constancy.

Soils.—Soil parent materials included only granitics and granitic-gneiss mixtures. Other soils data are lacking, but fragmentary evidence suggests pH and percent exposed rock and soil are lower than on adjacent drier sites of the *PIAL* and *PICO* series.

Productivity/Management.—Timber productivity potentials are low to very low (appendix E-2). Some sites provide shelter for deer and elk that feed in nearby grasslands. Recreationists may use these sites for camping but recovery potential from these impacts is low. Watershed values may be relatively high on these sites.

Other Studies.—In Montana the vegetation and site conditions for this habitat type have been described in detail by Weaver and Dale (1974). Its floristics and chorology are documented by Forcella (1978); Forcella and Weaver (1977) have modeled its production and biomass. In the Wind River Mountains, Reed (1969) described a *Pinus albicaulis-P. flexilis/Potentilla diversifolia* h.t., which he later renamed the *P. albicaulis/V. scoparium* h.t. (Reed 1976). Reed's 60 percent constancy for *V. scoparium*, however, indicates that this renamed h.t. does not correspond entirely to our *PIAL/VASC* h.t., which has 100 percent constancy for *V. scoparium*.

Pinus albicaulis/Carex geyeri h.t. (*PIAL/CAGE*; whitebark pine/elk sedge)



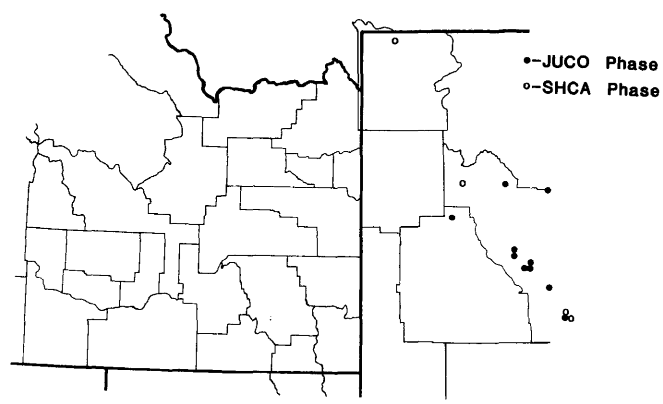
Distribution.—*PIAL/CAGE* is a minor h.t. that was found only in Yellowstone National Park and adjacent Idaho. It ranged from about 2 225 to 2 865 m (7,300 to 9,400 feet) and was usually at the high elevations of the forest zone. It occurs on steep southerly to westerly aspects and at somewhat lower elevations on gentle benches and flats.

Vegetation.—On steep upper slopes, *Pinus albicaulis* is often the sole dominant and is rather widely spaced, with a high proportion of multistemmed forms. On the lower more gentle terrain *P. contorta* is a successful seral dominant, with *P. albicaulis* usually present in lesser amounts. *Carex geyeri* strongly dominates the undergrowth and is usually associated with *Festuca idahoensis, Stipa occidentalis*, and *Trisetum spicatum*. The forb layer is occasionally diverse and belies the relatively dry aspects of these sites.

Productivity/Management.—Our limited data suggest that the greatest values of these sites are snowshed protection, big game cover, and bird and rodent forage.

Other Studies.—Cooper (1975) previously described a somewhat broader *PIAL/CAGE* h.t. in Yellowstone National Park and adjacent Idaho. He also interpreted a *Pinus contorta* phase on the more gentle terrain and a *Pinus albicaulis* phase on the steep upper slopes but the data needed to characterize near-climax conditions of these phases are lacking.

Pinus albicaulis/Juniperus communis h.t. (*PIAL/JUCO*; whitebark pine/common juniper)



Distribution.—*PIAL/JUCO* is a major h.t. in the Wind River Range and appears sporadically in the Owl Creek and Absaroka Ranges and in Yellowstone National Park. It occurs from about 2 438 to 2 987 m (8,000 to 9,800 feet) on droughty sites having gentle slopes. It merges with various community types of the *Pinus contorta* series and with the more moist *PIAL/VASC* and drier *PIAL/CARO* h.t.'s.

Vegetation.—All but the highest elevation sites are strongly dominated by *Pinus contorta*, which may persist as a climax codominant. *P. contorta* reproduces sporadically within the stand and under favorable circumstances may establish nearly pure stands following fire. The more shade-tolerant *P. albicaulis* establishes very slowly but increases its representation in the stand through prolonged succession. Occasionally, mountain pine beetle accelerates the succession by killing the *P. contorta* and enhancing the competitive advantage of *P. albicaulis*.

Shepherdia canadensis (*SHCA*) phase.—This phase occurs throughout the distribution of the h.t. It ranges from about 2 438 to 2 652 m (8,000 to 8,700 feet) and probably represents the relatively warm low elevations of the h.t. *Pinus contorta* dominates most stands with lesser amounts of *P. albicaulis* scattered throughout. Usually, *Shepherdia canadensis* dominates the undergrowth and *Astragalus miser* or *Arnica cordifolia* are the most prominent forbs.

Juniperus communis (*JUCO*) phase.—The *JUCO* phase occurs mainly in the Wind River Mountains and occasionally in the Owl Creek Mountains. Although it ranges from about 2 438 to 2 987 m (8,000 to 9,800 feet), most sites occur above 2 621 m (8,600 feet), indicating that it probably represents a relatively cold segment of the h.t. *Pinus contorta* dominates most stands while *P. albicaulis* slowly invades the understory (fig. 28). Undergrowths are usually very depauperate, with small amounts of *Juniperus communis, Shepherdia canadensis*, and *Arctostaphylos uva-ursi* as the most common shrubs. *Astragalus miser* is often the most prominent forb, while *Arnica* is usually sparse. During extended periods without fire, *Juniperus communis* appears to achieve higher coverages, but *Shepherdia* shows little ability to increase under any condition.

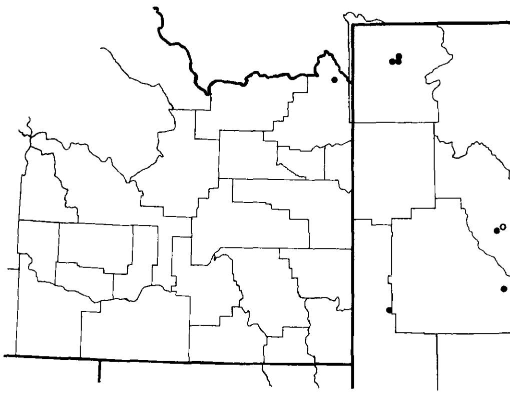
Soils.—Soils in the *JUCO* phase were derived mainly from granitics and sandstone and occasionally andesite. Limited data suggest that soils in the *SHCA* phase were derived from basalts and sedimentary material. Other soil differences appeared indistinguishable at the phase level. Soil pH ranged from 4.1 to 6.8 and averaged 5.6. Coverage of bare rock ranged from 0 to 38 percent and averaged 5.8 percent; areas of bare soil ranged from 0 to 15 percent and averaged 1.9 percent. Average litter depths per site, which only reached 5.5 cm (2.2 in), reflect the low productivity of this h.t.

Productivity/Management.—Timber potentials are mostly low and are further reduced by low stockability (appendix E-2). Occasional well-stocked stands may support pole and post cutting. Light use by deer and elk is common, but the forage values are quite low and the animals appear to be using these sites for cover. Livestock seldom use these sites except for occasional shelter.

Other Studies.—Reed's original paper (1969) on Wind River Range habitat types described a *Pinus albicaulis-P. flexilis/Potentilla diversifolia* h.t. and *Pinus contorta* c.t., several stands of which correspond to our *PIAL/JUCO* h.t.

Figure 28.—*Pinus albicaulis/Juniperus communis* h.t., *Juniperus* phase on a gentle west slope in the Middle Popo Agie drainage of the Wind River Range (2 591 m, 8,500 feet). An open stand of *Pinus contorta* dominates the site; *Pinus albicaulis* saplings and small patches of *Juniperus* are scattered throughout the stand. *Lupinus* is the prominent forb.

Pinus albicaulis/Carex rossii h.t. (*PIAL/CARO;* whitebark pine/Ross sedge)



Distribution.—*PIAL/CARO* is a major h.t. in the Wind River Range and Yellowstone National Park. It also appears in the eastern Absaroka, Gros Ventre, and Washakie Ranges and occasionally elsewhere. It occurs from about 2 316 to 3 200 m (7,600 to 10,500 feet) and rarely appears as low as 1 920 m (6,300 feet) on flat terrain. Adjacent drier sites are often *Festuca*-dominated grasslands. At moist extremes this h.t. merges with *PICO/ARCO* or *PICO/JUCO* community types or *PIAL/VASC* or *PIAL/JUCO* h.t.'s.

Vegetation.—Overstory composition varies between phases as noted below. Undergrowths are quite depauperate and have an average combined coverage of only 9 percent (range 2.5 to 35 percent). *Carex rossii* has the highest constancy in the undergrowth and occasionally shows a tendency to dominate.

Pinus contorta (*PICO*) phase.—This is the common phase within the h.t. It ranges from about 2 316 to 2 865 m (7,600 to 9,400 feet) and represents the relatively low warm elevations of the h.t. *P. contorta* dominates most stands, with lesser amounts of *P. albicaulis* scattered throughout (fig. 29). *P. albicaulis* increases with stand age and eventually codominates with *P. contorta*. Occasionally mountain pine beetle kills the *P. contorta*, leaving *P. albicaulis* as the sole dominant. Sometimes small amounts of *P. flexilis* are also present.

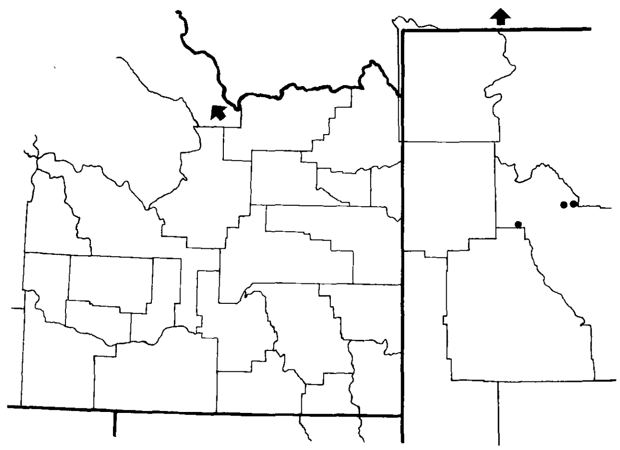
Carex rossii (*CARO*) phase.—The *CARO* phase ranges from about 2 896 to 3 200 m (9,500 to 10,500 feet) and represents the high cold elevations of the h.t. *Pinus contorta* is virtually absent in this phase, leaving *P. albicaulis* to dominate throughout most of the succession.

Soils.—Soil parent materials are predominantly granitics but also include sandstones, basalt, and andesite. The pH ranged from 4.4 to 6.3 and averaged 5.6. The coarse fraction averages a relatively high 19 percent. Coverage of bare soil and rock did not exceed 15 percent and was generally in the range of 1 to 5 percent. Litter depths generally do not exceed 7 cm (2.8 in) and average 3.2 cm (1.3 in).

Productivity/Management.—Timber productivity ranges from very low to moderate but is mostly low (appendix E-2). Forage production is also low. Light use for cover and bedding by deer, elk, and occasionally moose is common in this h.t.

Other Studies.—In the Wind River Range, Reed (1969) described a broad *Pinus albicaulis-Pinus flexilis/Potentilla diversifolia* h.t., which includes our *PIAL/CARO* h.t., *CARO* phase. He later described a *Pinus contorta/Poa nervosa* h.t. (Reed 1976) which apparently includes our *PIAL/CARO* h.t., *PICO* phase. In Yellowstone National Park, Cooper (1975) described a *PIAL/CAGE* h.t., part of which lacks *Carex geyeri* and equates to our *PIAL/CARO* h.t.

Pinus albicaulis/Festuca idahoensis h.t. (*PIAL/FEID;* whitebark pine/Idaho fescue)



Distribution.—*PIAL/FEID* is a minor h.t. that occurs sporadically from the Wind River and Absaroka Ranges to Montana and central Idaho. In the study area it was found from about 2 896 to 2 957 m (9,500 to 9,700 feet) where it represents a dry, cold extreme of the forested zone. Adjacent drier sites are usually nonforested and have *Festuca idahoensis* as the dominant grass. Adjacent more moist sites vary and may be in the *PIAL, ABLA* or *PIEN* series.

Vegetation.—*Pinus albicaulis* is usually the only dominant conifer. An occasional stunted *Picea* or *Populus tremuloides* may be found and a few *Pinus contorta* are sometimes present. A diverse layer of forbs and grasses constitute the undergrowth and often have a high combined coverage. Of these, *Festuca idahoensis* is usually the predominant grass.

Soils.—Limited data suggest that soils were derived from granitics, rhyolite, and mixtures of quartzite and sandstone. The pH ranged from 5.3 to 7.1 and averaged 6.2. Areas of bare soil and rock were less than 1 percent. Average litter depth per site reached 6 cm (2.4 in) but averaged only 2.9 cm (1.1 in).

Productivity/Management.—Timber productivity potentials are very low to low (appendix E-2) and the *Pinus albicaulis* is often of noncommercial quality. Forage production is

Figure 29.—*Pinus albicaulis/Carex rossii* h.t., *Pinus contorta* phase near Louie Lake at the southern tip of the Wind River Range (2 697 m, 8,850 feet). *Pinus contorta* dominates this gentle southwesterly slope. Young *P. albicaulis* are scattered through the stand. *Carex rossii, Poa nervosa*, and *Lupinus argenteus* have the highest frequency in this depauperate undergrowth.

fair and both domestic livestock and big game feed on these sites. This h.t may accumulate only light snowpacks as it often occupies windswept exposures.

Other Studies.—*PIAL/FEID* communities have been mentioned in studies from Montana (Pfister and others 1977) and central Idaho (Steele and others 1981) but were not formally described.

Pinus contorta Series

Distribution.—This series consists of essentially pure stands of *Pinus contorta*, which contain insufficient evidence to indicate that any other tree species is the potential climax. The very broad ecological amplitude of *P. contorta* (Pfister and Daubenmire 1975) permits this series to span the environmental range between the cold portion of the *Pseudotsuga* series and all but the wettest portions of the *Abies lasiocarpa* and *Picea* series. Thus, *P. contorta* community types are common in all but the *Pinus flexilis* series, where they appear only in the *PIFL/JUCO* h.t.

Vegetation.—*Pinus contorta* is a major seral species throughout much of the Rocky Mountains. It is often the first tree to reforest severely disturbed sites and is usually replaced by other conifers within one generation. There appears to be a tendency for *P. contorta* to be only seral on steep slopes and more persistent on gentle terrain. In some broad valleys at upper elevations, *P. contorta* persists for many generations with little or no evidence of replacement. Slopes above such valleys exhibit intermediate situations where *P. contorta* persists but is gradually replaced by *Abies lasiocarpa* and *Pseudotsuga*. On gentle slopes and benches near upper timberline, *Pinus contorta* dominates sites where *P. albicaulis* is apparently the potential climax dominant.

Although *P. contorta* is a pioneer conifer throughout its range, its ability to remain dominant appears related to topoedaphic factors (Pfister and Daubenmire 1975). Upper limits of persistent *P. contorta* stands often resemble a contour and suggest a response to cold air drainage and impoundment. *Pinus contorta* is well adapted to cold air drainages as evidenced by its ability to colonize sites near receding glaciers (Heusser 1969). Over millenia, *P. contorta* seedlings have periodically invaded raw substrates of glacial alluvium and have been subjected to intense daily insolation and nightly cold air accumulation and frost. Today, *P. contorta* still dominates valley floors of glacial debris in Idaho, Wyoming, and Montana in spite of other coniferous seed sources on adjacent uplands. Although *Abies lasiocarpa* and *Picea engelmannii* extend to upper timberline and replace *Pinus contorta* on steeper slopes, their tolerance of daily temperature extremes on these gentle valleys and droughty soils appears less than that of *P. contorta*.

Undergrowth vegetation obviously varies according to the potential climax of the stand and stocking rate of *Pinus contorta*. Stands that show the greatest potential for being climax to *P. contorta* have the most depauperate undergrowth. Young "dog hair" stands have virtually no undergrowth cover even on relatively moist sites. In this series, unusually low undergrowth coverages, which normally increase as canopy openings increase, provided part of the rationale for the downward adjustment of coverages in the key to h.t.'s when dense stands were encountered.

Soils.—Studies cited below document that *P. contorta* can remain dominant on gentle terrain for many generations and in fact can attain climax status. On these sites *P. contorta* remains dominant by default, owing to the inability of other conifers to colonize these sites. *Pinus contorta* also appears to be favored, and potential competitors reduced in vigor, by particular parent materials, such as sandstones, coarse textured sands, and sandy outwashes derived from rhyolite and granitics. In eastern portions of the study area, *P. contorta* was noted to occur to lower treeline on sandstones but was rarely found on calcareous substrates except on those mixed with other parent materials such as sandstone. Generally, persistent *P. contorta* stands are developed on acidic substrates that exhibit low pH values, mostly less than 6.0.

Fire.—Pure *P. contorta* stands have often been attributed to fire; yet fire is a minor factor in the most persistent stands. Undergrowths in these valley bottom or terrace stands are sparse and produce little fuel. Most of the fuel occurs on adjacent slopes and natural fires on the valley floor that did not ascend the adjacent slopes would be unusual. Yet, quite often only the valley bottom contains nearly pure *P. contorta* and adjacent slopes are in advanced stages of succession to *Abies, Picea,* and *Pseudotsuga.*

As noted above, upper limits of persistent *P. contorta* stands often resemble a contour rather than patterns of previous fires and the cones of *P. contorta* populations are largely nonserotinous. Thus there is little evidence for fire maintaining these stable *P. contorta* stands. In fact, stands which appear closest to a *P. contorta* climax have the widest-spaced trees (without fire scars), the least undergrowth, and gentlest slopes, all of which are unfavorable to fire spread. There are other valley and bench areas that have experienced repeated burnings, but these sites frequently show evidence of repeated fires and produce enough fuel to generate an effective burn.

Productivity/Management.—Timber potentials should range from very low to moderate, depending on the h.t. involved. From a practical standpoint, most of these stands can be managed as if *Pinus contorta* were climax even though other conifers may eventually invade the stand.

Deer, elk, and moose use these stands for cover, but seldom find much forage. These stands usually lack the structural diversity sought by lesser wildlife but may have some value to wildlife or livestock, depending on existing undergrowth and types of cover.

Most of these sites have gentle terrain, which provides easy access and development for recreation facilities. Recreationists, however, may prefer areas that receive less frost and have a less monotonous appearance. Recreational impacts may be low on these gentle slopes, but recovery rates are apt to be slow.

The community types (c.t.'s) of this series represent situations in which *P. contorta* may be the only conifer on the site. On some sites this situation occurs only in initial stages of secondary succession and indications of the potential climax community are usually evident. On other sites, climax indicators invade more slowly and *P. contorta* is a more persistent dominant. Here, determining the habitat type is more tenuous and often requires thorough investigation of the immediate and adjacent sites. There are a large number of h.t.'s among the *Abies, Picea, Pseudotsuga,* and *Pinus albicaulis* series that can support pure *Pinus contorta* stands when other seed sources are absent (appendix B). If the undergrowth indicator species are present, these stands can usually be assigned to the proper h.t. by using the key to *P. contorta* c.t.'s. Other sites where the climax status for *P. contorta* is in question can be treated as c.t.'s. From a practical point, these c.t.'s can be managed as if *P. contorta* were climax even though *Pseudotsuga, Picea, Abies,* or *Pinus albicaulis* may eventually invade the stand. Although several conditions on gentle terrain appear to support *P. contorta* climax, no recognizable situation in the study area was found that consistently maintains *P. contorta* as the sole climax dominant. It is possible, however, that *P. contorta* h.t.'s do exist but have undergrowths similar to those of the other tree series.

Other Studies.—*Pinus contorta* also exists as a persistent dominant in other regions. In south-central Oregon, Franklin and Dyrness (1973) describe climax stands of *P. contorta* on pumice soils. These stands occur on micro-reliefs that impound cold air to the exclusion of *P. ponderosa* occurring upslope. Pfister and others (1977) and Cooper (1975) describe a *P. contorta/Purshia tridentata* h.t. near West Yellowstone, Mont. The plant community here occurs on extensive obsidian-rhyolite outwash sands of the Madison River Valley and is remarkably similar to that of the south-central Oregon pumice deposits. Occupying the vast rhyolitic Central Plateau of Yellowstone Park is a *P. albicaulis/Carex geyeri* h.t., *P. contorta* phase (Cooper 1975), that contains a number of stands which presently support a *P. contorta/Carex rossii* c.t. In central Idaho, Steele and others (1981) have described a *P. contorta/Festuca idahoensis* h.t. that occurs on broad alluvial deposits. For the Bighorn Mountains of Wyoming, Hoffman and Alexander (1976) characterize *P. contorta/*

Arctostaphylos uva-ursi and *P. contorta/Vaccinium scoparium* h.t.'s and Despain (1973) has shown areas of *P. contorta* dominance to be associated with granitic and sandstone substrates. In the Wind River Mountains, Reed (1976) recognized a fairly broad *P. contorta/Poa nervosa* h.t. which apparently includes our *PIAL/JUCO* and *PIAL/CARO* h.t.'s and several *P. contorta* c.t.'s. On the Colorado Front Range, Moir (1969) described a stable zone of *P. contorta* that relates to gentle, undulating terrain rather than adjacent canyon topography. In northwestern Colorado, Hoffman and Alexander (1980) report a *P. contorta/Shepherdia canadensis* h.t.

Pinus contorta/Linnaea borealis c.t. (*PICO/LIBO*; lodgepole pine/twinflower)

Distribution.—*PICO/LIBO* is most apt to occur from the Wind River Mountains northward to Yellowstone National Park. It occupies mostly benches and lower slopes having northerly to easterly aspects. It appears mainly at low to mid-elevations of the *Abies lasiocarpa* zone and at mid-elevations of the *Picea* zone.

Vegetation.—Either *Vaccinium scoparium* or *Berberis, Shepherdia, Rosa*, and *Vaccinium globulare* are prominent shrubs, depending on the h.t. and phase involved. *Linnaea borealis* is common throughout the stand even though other shrubs may dominate the undergrowth. Usually, *Arnica cordifolia* is the most common forb.

Productivity/Management.—*Pseudotsuga, Picea* or *Abies* should invade these sites fairly rapidly. This c.t. represents early successional stages on the *PIEN/LIBO* and *ABLA/LIBO* h.t.s. Management guidelines for *PICO/LIBO* should be comparable to these two h.t.'s.

Pinus contorta/Vaccinium globulare c.t. (*PICO/VAGL*; lodgepole pine/blue huckleberry)

Distribution.—The *PICO/VAGL* c.t. is likely to occur from Yellowstone Park south to Utah, but is absent in the Wind River Range, the southern end of the Absaroka Range, and east slope of the Wyoming Range. Extensive stands occur in the Island Park Basin. It may be found on moist slopes or, more likely, benches having northerly to easterly aspects.

Vegetation.—Usually *Vaccinium globulare* dominates the undergrowth and is accompanied by *Lonicera utahensis*. *Calamagrostis rubescens* and *V. scoparium* may be well represented.

Productivity/Management.—Because these sites favor reproduction of *Pseudotsuga, Picea*, and *Abies*, this c.t. is relatively rare. Only the earliest stages of secondary succession following widespread wildfire represent this c.t. Most of this c.t. occurs on the *ABLA/VAGL* h.t., but on the Targhee National Forest it may also occur on *PSME/VAGL*. *Pinus contorta* productivity on these sites is likely to be comparable to that of *Picea* and *Pseudotsuga*.

Pinus contorta/Vaccinium scoparium c.t. (*PICO/VASC*; lodgepole pine/grouse whortleberry)

Distribution.—In the study area, the *PICO/VASC* c.t. appears mostly in western Wyoming and is widespread in the Wind River Mountains. It can be found on a variety of slopes and aspects at mid- to upper elevations of the *Abies lasiocarpa* zone and lower *P. albicaulis* zone.

Vegetation.—A low cover of *Vaccinium scoparium* usually dominates the undergrowth. Other shrubs, if present, are usually sparse and well scattered. A few forbs such as *Arnica cordifolia* and *Lupinus* spp. are often present and may attain high coverages in patches. *Pinus albicaulis* may be present, but weakly represented.

Productivity/Management.—Most *PICO/VASC* c.t.'s in the study area occupy the *ABLA/VASC* or *PIEN/VASC* h.t., but on gentle slopes and broad benches an occasional *PICO/VASC* c.t. may appear so persistent as to suggest a *P. contorta* climax. Many of these latter situations are probably a *PIAL/VASC* h.t. Farther east in the Bighorn Mountains where *Pinus albicaulis* is rare, Hoffman and Alexander (1976) have described a *PICO/VASC* h.t. that is virtually identical to the *PICO/VASC* c.t. *Pinus contorta* is the most suitable timber species, but productivities will vary depending on the h.t. involved. Although these stands seldom produce much forage for livestock or big game, deer, elk, and moose frequently use them for cover.

Pinus contorta/Spiraea betulifolia c.t. (*PICO/SPBE*; lodgepole pine/white spirea)

Distribution.—The *PICO/SPBE* c.t. may occur from Palisades Reservoir northward to Yellowstone Park. It may be found on various aspects of gentle slopes and benches near the contact of the *Pseudotsuga* and *Abies* zones.

Vegetation.—*Spiraea betulifolia* usually dominates the undergrowth, but it may be subordinate to *Calamagrostis rubescens*, especially in early successional stages.

Productivity/Management.—This c.t. is apparently scarce and represents early stages of secondary succession on the *ABLA/SPBE* or *PSME/SPBE* h.t.'s. Inspection of surrounding sites should indicate the climax potential. The appropriate h.t. description may be consulted for management implications.

Pinus contorta/Calamagrostis rubescens c.t. (*PICO/CARU*; lodgepole pine/pinegrass)

Distribution.—The *PICO/CARU* c.t. occurs most often in the vicinity of Yellowstone Park and the Island Park Basin but may occur southward to the Idaho-Utah border. It occupies various cool, dry aspects having gentle to moderate relief.

Vegetation.—*Calamagrostis rubescens* and *Carex geyeri* often dominate the undergrowth. Shrubs are sparse but may include *Prunus, Berberis, Pachistima, Amelanchier*, and *Symphoricarpos oreophilus*.

Productivity/Management.—Depending on location, the *PICO/CARU* c.t. varies from a clearly seral to a persistent successional stage. It usually occupies either the *ABLA/CARU* or *PSME/CARU* h.t. The more persistent *PICO/CARU* c.t.'s are most likely to occur on the

ABLA/CARU h.t. If *Prunus, Berberis,* or *Symphoricarpos oreophilus* are well represented, the site is most apt to be a *PSME/CARU* h.t. Inspection of less disturbed sites nearby may indicate which h.t. is appropriate. If the site indicates more affinities with *ABLA/CARU*, then *P. contorta* should be the most manageable tree for timber. If the site shows stronger affinities with *PSME/CARU*, then either *P. contorta* or *Pseudotsuga* may be desirable timber species. If the h.t. cannot be determined, management guidelines for *ABLA/CARU* would best apply.

Pinus contorta/Carex geyeri c.t. (*PICO/CAGE;* lodgepole pine/elk sedge)

Distribution.—The *PICO/CAGE* c.t. is most common on the granitic substrates of central Idaho but also occurs in Yellowstone National Park where it appears most frequently on the vast rhyolitic flows. It usually occupies the cool, dry aspects of relatively gentle terrain.

Vegetation.—Normally *Carex geyeri* dominates a depauperate undergrowth that contains only a few forbs. *Arnica cordifolia* and *Lupinus* spp. are the forbs having the highest coverage and constancy. Shrubs are seldom conspicuous.

Productivity/Management.—Most *PICO/CAGE* c.t.'s occupy the *ABLA/CAGE* h.t., especially on acidic volcanics, or the gentle terrain of the *PIAL/CAGE* h.t. In either case, *P. contorta* is the most suitable timber species but productivities may vary between h.t. Unless inspection of adjacent areas clearly indicates a position within the *Abies lasiocarpa* zone, management guidelines for the *PIAL/CAGE* h.t. would best apply.

Pinus contorta/Juniperus communis c.t. (*PICO/JUCO;* lodgepole pine/common juniper)

Distribution.—This c.t. may appear in moderate amounts, particularly near the eastern periphery of the study area. It has been noted in the southeastern portions of the Absaroka Range, the Owl Creek Mountains, and at upper elevations on granitics and sandstones in the Wind River Range. Though recorded on various aspects of steep topography, it was noted to be most extensive on gentle benches.

Vegetation.—Usually *Juniperus communis* is well represented but recent burns may have reduced its coverage. *Shepherdia canadensis* is usually present and may dominate the undergrowth, particularly on sandstones. *Arnica cordifolia, Lupinus* spp., and *Carex rossii* are usually present but have low coverages in a depauperate herb layer.

Productivity/Management.—The *PICO/JUCO* c.t. may occupy *PSME/JUCO, PIEN/JUCO, ABLA/JUCO,* and *PIAL/JUCO* h.t.'s as a seral community. If one remains on the same parent material, inspection of adjacent sites with a longer post-disturbance recovery time should indicate to which climax series and h.t. a *PICO/JUCO* c.t. site belongs. *Pinus contorta* should be the easiest tree to regenerate but on some sites *Pseudotsuga* may be more productive. In most cases management guidelines should conform to those for the closest determinable h.t. that has an undergrowth dominated by *J. communis*.

Pinus contorta/Shepherdia canadensis c.t. (*PICO/SHCA;* lodgepole pine/russett buffalo-berry)

Distribution.—The *PICO/SHCA* c.t. is apt to appear throughout much of the study area but is most common in the Wind River Range and southern end of the Absaroka Range. It can range from the cool extremes of the *Pseudotsuga* zone to the warm extremes of the *Pinus albicaulis* zone. It may occupy a variety of slopes and aspects but is most common on gentle toeslopes and benches.

Vegetation.—*Shepherdia canadensis* usually dominates the undergrowth, which in some cases is very depauperate. *Arnica cordifolia* usually dominates a sparse forb layer. Graminoids usually are scarce.

Productivity/Management.—The *PICO/SHCA* c.t. could occur on a wide range of h.t.'s, but it is generally an early to mid-seral stage of the *PSME/JUCO, PIEN/JUCO, ABLA/JUCO, ABLA/ARCO* or *PIAL/JUCO* h.t.'s. Inspection of adjacent stands should help to narrow the h.t. determinations to one or two possibilities. In most situations, *Pinus contorta* is the best suited species for timber management but productivity may vary considerably between h.t.'s.

Pinus contorta/Arnica cordifolia c.t. (*PICO/ARCO;* lodgepole pine/heartleaf arnica)

Distribution.—The *PICO/ARCO* c.t. may be found in the southern Absaroka Mountains and Owl Creek Range southwestward to the Bear River Range. It also occurs in east-central Idaho. This c.t. occupies various aspects on gentle terrain at mid- to upper elevations of the forested zone.

Vegetation.—Pure stands of *P. contorta* are most common, but occasionally small amounts of *P. albicaulis* or *P. flexilis* are also present. *Arnica cordifolia* usually dominates a depauperate undergrowth but occasionally *Pyrola secunda* has higher coverage. *Antennaria racemosa* and *Astragalus miser* may also codominate. *PICO/ARCO* c.t.'s become increasingly stable in age structure southeastward through the Wind River Range and some resemble h.t.'s near their southeastern limits.

Productivity/Management.—*PICO/ARCO* c.t.'s occupy the *ABLA/ARCO, ABLA/JUCO, PIEN/ARCO, PIEN/JUCO, PIAL/JUCO*, and to a lesser degree the *PSME/ARCO* and *PSME/JUCO* h.t.'s. *Pinus contorta* should regenerate better than other conifers on these unproductive sites. On some sites, productivities of *Pseudotsuga* and *Picea* may be comparable to that of *P. contorta*. In most areas, attempts to regenerate *Pseudotsuga* on granitic or sandstone parent materials will have a low probability of success.

Pinus contorta/Carex rossii c.t. (*PICO/CARO;* lodgepole pine/Ross sedge)

Distribution.—The *PICO/CARO* c.t. was found mainly in Yellowstone National Park and vicinity on the extensive rhyolite and tuff formations, and in the Wind River Range (fig. 30). It generally occupies gentle terrain at mid-elevations of the *Abies lasiocarpa* zone, but in the Wind

Figure 30.—A *Pinus contorta/Carex rossii* community type on a gentle bench near the southern end of the Wind River Range (2 621 m, 8,600 feet). *Pinus contorta* dominates the site and the dead fallen trees are also *P. contorta. Carex rossii* has the highest frequency in this depauperate undergrowth. This site is most likely a *PIAL/CARO* h.t., *PICO* phase or possibly an undescribed *PICO/CARO* h.t.

River Range was also noted in the *Pinus albicaulis* zone on steep topography and granitic soils.

Vegetation.—Open stands of pure *Pinus contorta* dominate the site and small amounts of *Picea, Abies lasiocarpa*, and *Pinus albicaulis* may occur. Undergrowths are very depauperate; *Lupinus argenteus, Solidago multiradiata, Sedum lanceolatum, Pyrola secunda*, and *P. virens* (*P. chlorantha*) are the herbs of highest constancy; *Poa nervosa* and *Carex rossii* are the most common graminoids. Of these, *Carex rossii* shows the greatest tendency to dominate.

Productivity/Management.—This c.t. is usually found on the *PIAL/CARO* h.t., *PICO* phase, but may also occur on *ABLA/CARO* and more severely disturbed *ABLA/ARCO, ABLA/PERA* and *PIEN/ARCO* h.t.'s. It was also observed as an early seral stage on clearcut, burned, and grazed *ABLA/VASC*.

Populus tremuloides Series

Populus tremuloides dominates a variety of sites within the study area. It is relatively scarce in the northern periphery of the study area, but it becomes increasingly prevalent to the south and east. Its successional role varies from a purely seral species to persistently seral and even climax. The most apparent climax stands are those that occur beyond the lower limits of conifers. These stands frequently occupy concave slopes of low hills and even occur in the *Artemisia tridentata* zone on basalt talus, lava tubes, and boulder fields.

In terms of succession, the stands bordering coniferous forest are the most perplexing. The *Populus* here are often vigorous and will quickly invade adjacent sites when the conifers are removed. These stands often contain an occasional healthy conifer that shows little sign of increasing in the stand. In seemingly pure *Populus* stands a diligent search sometimes reveals a few conifer seedlings that are healthy but damaged by rodents and grazing animals. On these sites it is questionable that conifers will ever replace *Populus*. These plant communities have been classified in much of the study area by Youngblood (1979).

Within the zone of coniferous forest, *Populus* stands tend to become more clearly seral. Here *Populus* occupies sites where fire or logging has removed the conifers or where landslides have provided a fresh substrate. Conifers may reclaim these sites fairly rapidly but in some areas conifer establishment appears retarded by a lush development of seral forbs and graminoids. In these cases conifer establishment sometimes is confined to the raised microsites of fallen *Populus* logs.

Undergrowths of *Populus* stands vary considerably, but generally resemble the undergrowths of adjacent conifer-dominated communities; most often these coniferous communities are in the *Pseudotsuga* series or warm portion of the Abies series. Where *Populus* is obviously climax, the undergrowth often relates to the adjacent *Symphoricarpos oreophilus/Artemisia tridentata* communities and may form a *P. tremuloides/S. oreophilus* association as broadly described by Reed (1971) and refined by Youngblood (1979).

Populus communities are heavily utilized by domestic stock, often to the point of becoming significantly modified in composition. *Nemophila breviflora, Dactylis glomerata, Cerastium arvense, Rudbeckia occidentale*, and *Poa* and *Helianthella* spp. are typical of abused stands. A number of exclosures in the Yellowstone National Park area indicate that wintering big game populations are capable of significantly modifying *Populus* communities. Severe browsing by elk and moose on *Populus* root sprouts may gradually convert the older decadent stands to shrub- or forb-dominated sites (Krebill 1972).

Other Forest Vegetational Types

Though this classification attempts to treat most forest land in the study area, several situations that support trees were intentionally excluded.

Juniperus osteosperma Communities

In southern portions of the study area, *Juniperus osteosperma* forms extensive stands on the foothills below the coniferous forest zone. A yet more depauperate community of *J. osteosperma*, with minor amounts of *Pinus flexilis*, occurs on scablands and rock outcrops below the forest border in basins to the east of the Wind River, Owl Creek, and Absaroka Ranges.

Juniperus scopulorum Communities

In the Snake River Range and immediately south of Island Park, *Juniperus scopulorum* occasionally appears in pure stands or mixed with *Cercocarpus ledifolius*. These stands occur below the limits of *Pseudotsuga* or occupy lithosols of south to southwest aspects. Similar conditions without *C. ledifolius* are reported in Montana (Pfister and others 1977) but were not sampled. No effort has been made to classify these communities in the Pacific Northwest.

Acer grandidentatum Communities

In parts of southeastern Idaho and adjacent Wyoming, communities dominated by *Acer grandidentatum* are interposed between the *Pseudotsuga* series and *Populus tremuloides* or sage-grass communities. Some undergrowths in these *Acer* stands are comparable to those of *Pseudotsuga* h.t.'s; others are not. *Acer grandidentatum* communities are part of an extensive mountain shrub zone that is more common in Utah and Nevada where classification of these sites should be initiated.

Flood Plain Communities

A few of the larger rivers, such as the Snake (both forks), Wind, Green, and Shoshone, form flood plains or at least a broad braided course where they encounter more gentle terrain. Various combinations of *Picea pungens, P. engelmannii, Populus trichocarpa, P. angustifolia, P. balsamifera, Betula occidentalis, Crataegus douglasii, Elaeagnus commutata, Salix* spp. and certain other trees and shrubs combine to form a series of bottomland communities. The conifers are usually weakly represented, but *P. pungens* and *P. engelmannii* appear to constitute climax species on long-stabilized alluvium in certain locations. In Jackson's Hole, Forsgren (1977 unpubl.) and Reed (1952) report for two limited stretches of the Snake River the possibility of succession from *Salix*- and *Populus*-dominated communities to *Picea*-dominated stands, though the great majority of *Populus*-dominated stands will remain as such. Fluctuations in stream activity continually alter water tables and courses and cyclic floods modify soil depths and substrate composition. For these reasons many riparian situations have unstable vegetation potential and do not lend themselves to the "potential-climax" habitat type concept.

INDIVIDUAL ATTRIBUTES OF HABITAT TYPES

Soils

Characteristics of the upper 10 cm (3.9 in) of soil are summarized in appendix D-1 and as a paragraph in most habitat type descriptions. Rock samples were examined in the laboratory by soil scientists (James Clayton, Intermountain Forest and Range Experiment Station, and Jeff Lelek, University of Montana) to determine the parent material. Air-dry samples were weighed, sieved (2 mm) to separate the gravel, and reweighed to determine percent gravel content. The soil separate was tested for pH with a glass electrode pH meter in a water paste solution.

Soil sampling and analyses were designed to obtain a simple characterization of surface soils for each habitat type, rather than detailed soil-vegetation relationships. Even our limited data (appendix D-1) make it evident that some habitat types are strongly influenced by edaphic or topo-edaphic factors and have a narrow range of soil characteristics. Certain *Pinus flexilis*, *Pseudotsuga*, and *Picea* h.t.'s show a strong affinity for calcareous substrates. Several habitat types such as *PIEN/CALE, PIEN/CADI*, and *ABLA/CACA* occur where water tables are close to the surface at least part of the year. Other habitat types such as *PSME/ARCO, ABLA/ARCO*, and *ABLA/VASC* occur on a broad range of soils. Some of the wet-site habitat types commonly have the greatest litter accumulations and the least exposed soil and rock. In contrast, some of the most severe habitat types have the least litter and greatest areas of exposed soil and rock.

It is often theorized that vegetation or habitat types can be predicted from soil characteristics. But R. and J. Daubenmire (1968) have emphasized that an overall correlation between habitat types and soil types (classified on the basis of standard soil profile characteristics) is too weak to allow prediction of habitat types from soil types, or vice versa, even though correlations often exist locally. We support this viewpoint as a general rule for several reasons. First, the development of a soil profile reflects a long-term integration of soil forming factors, whereas vegetational development is much more sensitive to current climatic conditions. Second, soil classification systems are not designed to primarily reflect influences on vegetational development; therefore, predictive capabilities should not necessarily be expected. Third, vegetational development depends on many factors, of which soil characteristics is only one. Plants are able to grow on a wide range of substrates when other factors provide compensatory effects. Thus, properties used to separate soil taxa may not be critical to the vegetation of that area.

Land managers should be cautious about attempting to "shortcut" inventories of either vegetational potentials or soils through the process of "assumed correlations." Some useful correlations undoubtedly exist; but they must be developed objectively, tested adequately, and extrapolated with caution.

Climate

Appendix D-2 shows generalized climatic patterns for various habitat types and phases. Most of the data are from U.S. Weather Service stations. The habitat type and phase shown for each station is an estimation of the appropriate climatic climax.

Other climatic data representing specific forest habitat types may be available from Weather Service records or various special studies. Nevertheless, careful evaluation of the site is necessary to determine the appropriate climatic climax. For instance, climatic data from a site supporting an edaphic climax should be interpreted in relation to the nearest expression of a climatic climax, rather than the immediate edaphic climax.

Ecologic Roles of Plant Species

Most plant species express different synecologic roles in different portions of their environmental distribution. A given species can be either a dominant or subordinant, and either climax or seral in different environments. Thus how a species performs on a given site depends on its position within its own environmental distribution as well as the relative positions of its competitors. Relative ecologic expressions of important species in eastern Idaho-western Wyoming forests are presented in several ways.

The occurrence and roles of tree species (appendix B) reflects the relative amplitude and successional status of tree species in the various h.t.'s and phases. This chart provides some of the basic information needed to select and manage the tree species best adapted to a given forest environment. For instance, *Pseudotsuga menziesii* is a major seral species in some *Picea* and *Abies* habitat types but is climax in the *Pseudotsuga* series. In general, the seral species is easier to regenerate following stand disturbance (depending on severity) than the climax species.

The constancy and average coverage data (appendix C) portray the relative amplitude of major forest species and degree of dominance through the environmental spectrum of forest habitat types. Comparison of habitat types using these data from mature stands provides insight to the habitat type classification that is not available in the keys or written descriptions. These tables also condense the vegetal information of each habitat type and reduce the need for elaborate vegetative descriptions.

Timber Productivity

Timber productivity is one of the key management concerns of this study. Site trees were selected to determine the potential height growth of relatively free-growing trees. One site tree of each species was selected for each stand wherever possible. Unfortunately, many stands lacked suitable site trees and some of the stand data incorporated from other studies did not include site index values; as a result, some h.t.'s have a small sample number for timber productivity. Site trees showing marked diameter-growth suppression (diameter growth during a 30-year period less than growth during any subsequent 10-year period) were rejected during analysis of the increment cores. Diameter growth suppression periods of 10- and occasionally 20-year periods were not uncommon in the site trees remaining for productivity analyses. Stagnated trees were not used for productivity estimates. Old-growth trees were used, however, if they occurred in relatively even-aged stands. In most cases only a single site tree per species per stand was used, except for Cooper's (1975) data, which represents an average of 3 to 6 site trees per species per stand. In general, the data are reasonably consistent; comparisons appear to be valid, and the large number of sample sites (982 stands) permits comparison of productivity among habitat types as well as within each habitat type.

Determination of site index from height-age data requires specific procedures for each tree species. The number of years to reach breast height (1.37 m, 4.5 feet) was estimated for species having height-total age site curves but ideally age to breast height should be measured. If a site curve is not available, a curve from another species must be selected as a substitute. Criteria used to determine total age, as well as sources of site index curves and yield capability data for this analysis, are summarized in table 2.

Pinus ponderosa curves (1958) were used to determine *Pseudotsuga* site index rather than Brickell's (1968) *Pseudotsuga* curves, because *P. ponderosa* curve shapes more closely approximate the growth response of *Pseudotsuga* in the Intermountain Region (give closer estimates for different aged site trees in the same stand). This choice of site curves is further strengthened by the fact that in the northern Rocky Mountains *P. ponderosa* yield tables are currently used to determine *Pseudotsuga* yields.

Table 2.—Criteria and sources for determining site index and for estimating yield capability

Species	Estimated years to obtain breast height	Source of site curve[1]	Yield capability (All trees - Figure 4)
PIPO	10	Lynch 1958	Brickell 1970
PSME	10	-------------------------Used PIPO curves	-------------------------
PICO	10	Alexander 1966	Used LAOC curve[2]
PIEN	([3])	Alexander 1967	Alexander[4]
ABLA	([3])	-------------------------Used PIEN curves	-------------------------

[1]All site curves with a 100-year index age were converted to a 50-year index age.
[2]Brickell's (1970) curves for PICO and LAOC (trees larger than 5.0 inches) were nearly identical. A new curve (based on all trees) was developed for LAOC from yield data in Schmidt and others (1976). The LAOC curve for all trees appears to be as accurate as any available for estimating PICO yield capability for all trees.
[3]Curves based on age at breast height were used.
[4]Data used in a recent yield study (Alexander and others 1975) were provided by Alexander. Site index and mean annual increment from 21 fully-stocked natural stands were used to develop the curve shown in figure 4 (yield capability = 26.0 + 1.84 Site Index (50); R^2 = 0.66).

Alexander's (1967) *Picea engelmannii* curves were used for *Picea* spp. rather than Brickell's (1966) because: (1) Alexander's are based on breast-height age (data available) rather than estimated total age; (2) the curve shapes are more realistic for our region (closer estimates of site index for different aged site trees in the same stand); and (3) yield data related to the curves are available (Alexander and others 1975). Alexander's (1967) *P. engelmannii* curves were also used for other species lacking site index curves, because employing breast-height age avoids the errors inherent in total age estimation.

The site index data (50 years base age) have been summarized by species within habitat types (appendix E-1). Mean site index was calculated whenever three or more values were available. A 95 percent confidence interval (C.I. $= \bar{x} \pm s_{\bar{x}} \cdot t_{0.05}$) for estimation of the tree population mean was computed with five or more values. The confidence interval narrows with decreased variability ($s_{\bar{x}}$ becomes smaller) and increased sample size ($t_{0.05}$ decreases as n, sample size, increases). The same procedure was used for summarizing basal areas of sample stands.

Although site productivity can be compared by site index alone, estimated net yield capability (cubic foot) is more useful. Until managed-stand yield tables are completed, the best approach is to use natural-stand yield tables. As stated by Brickell (1970), "Yield capability, as used by Forest Survey, is defined as mean annual increment of growing stock attainable in fully stocked natural stands at the age of culmination of mean annual increment." In other words, yield capability equals the maximum mean annual increment attainable in fully stocked natural stands.

The curves used to estimate yield capability from site index are presented in figure 31. Yield capability values are based on cubic feet of all trees (>0.5 inch d.b.h.). The *Larix occidentalis* (*LAOC*) curve was derived from Schmidt and others (1976). (Brickell's 1970 curve for this species was only for trees greater than 5.0 inches in diameter.) The *Larix* curve was also used for *Pinus contorta* because Brickell's (1970) curves (trees >5.0 inches) are almost identical for the two species, and because natural stand yield data have not been published for *Pinus contorta*.

The *Picea* curve was derived from original data used in developing managed stand yield tables (Alexander and others 1975). We calculated mean annual increment for all trees for 21 of Alexander's fully stocked natural stands near the age of culmination of mean annual increment (ages from 97 to 165 years). A linear regression of yield capability on Alexander's (1967) site index was conducted, converted to site index at base-age 50, and plotted in figure 31. [Yield Capability = -26.0 + (1.84 X 50-year site index) R^2 = 0.66]. The other curves were developed by Brickell (1970) from natural-stand yield tables.
The spread in these curves (fig. 31) indicates that natural-stand yield capability for a given site index varies by species. This illustrates the importance of using species-specific curves for estimating productivity. Current estimates of yield capability (in cubic feet/acre/year) for each habitat type are shown in appendix E-2. Procedures used to develop these estimates were:

1. Yield capability was estimated for each site tree from appropriate species curves according to the criteria in table 2. Values were plotted by species within habitat types and phases for a visual display of distribution.

2. Mean yield capability for all site trees in each habitat type was calculated and cutoff points were established to approximate 90 percent of the range of our data.

3. For habitat types where stockability appears to limit productivity, a stockability factor was developed. Basal area data (appendix E-1) for plots in these types were compared with Meyer's (1938) basal area data for *P. ponderosa* for fully stocked "normal" stands, following the approach of MacLean and Bolsinger (1973). From these calculations and additional observations, an average mean stockability factor was determined for several habitat types. This factor was multiplied by yield capability for a given site index to determine the adjusted yield capability. A factor of 0.05 was used to adjust the estimated range of productivity for these habitat types.

These current best estimates (appendix E-2) portray both relative productivity of habitat types and the range of productivity within a habitat type. From these estimates, it

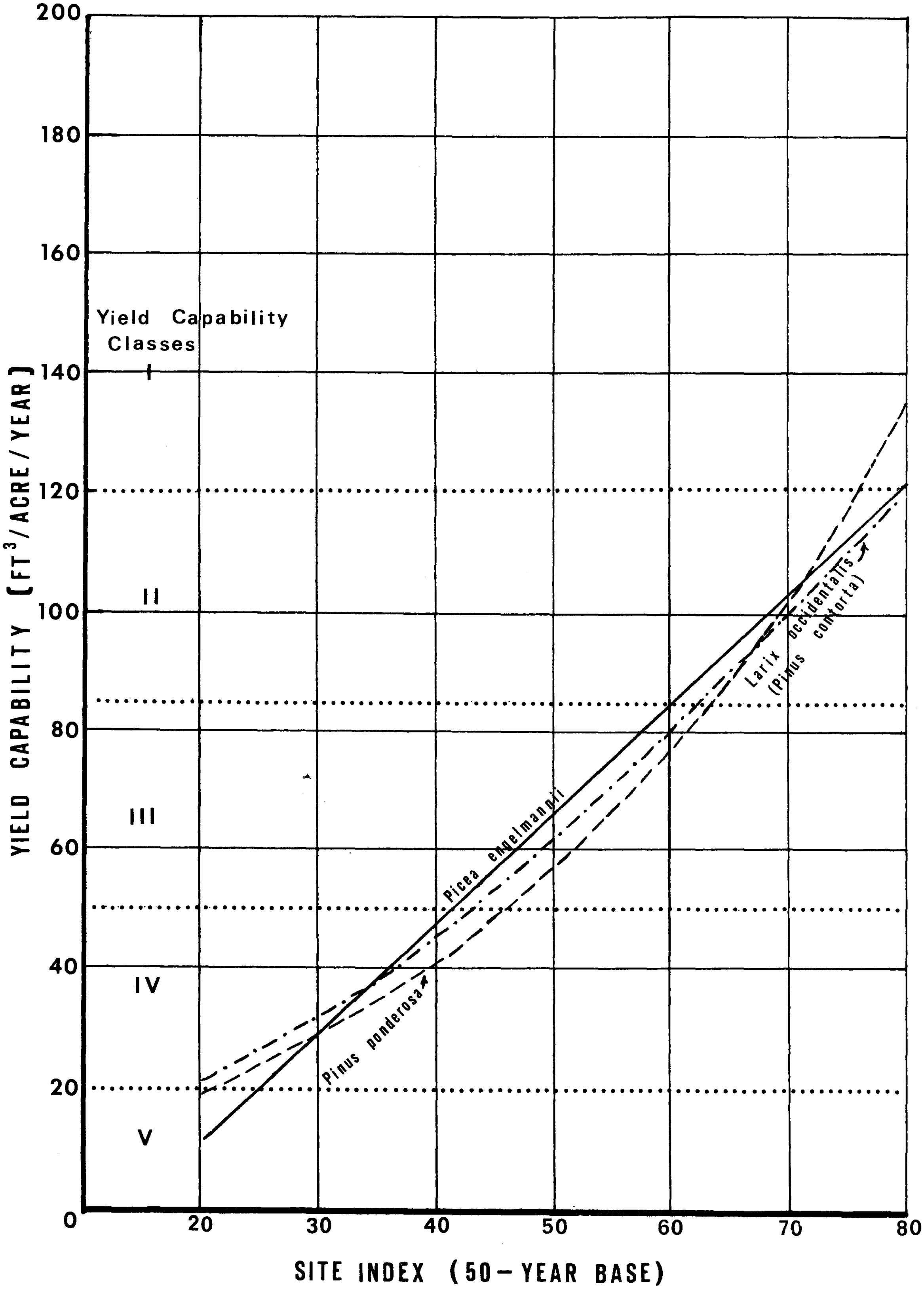


Figure 31.—Yield capability of fully stocked natural stands in relation to site index (revised from Pfister and others 1977).

is possible to assign a ranking or qualitative rating of potential timber productivity of natural stands for use in planning.

As Daubenmire (1976) emphasized, natural vegetation serves as a convenient indicator of productivity over large areas of land. But, productivity within habitat types (appendix E-2) often varies substantially. The following list explains this variability and offers suggestions for reducing it.

1. Site-index curves were used to obtain productivity estimates from yield tables. Different height-growth patterns undoubtedly occur on different sites just as they have been shown to vary with habitat type (Daubenmire 1961); however, data to account for this variation are not available.

2. Yield tables and site curves have not been developed for all species or all growth regions, making extrapolation necessary and tenuous at times.

3. Yields of mixed species stands can be estimated by several individual species yield tables. We found that a range in yield capability was common in individual stands, depending on the species used for estimation.

4. Some variability in productivity within a natural classification system, such as habitat types, is expected. The habitat type classification is based not on species rates of growth, but on their ability to mature and reproduce under competition, which encompasses all their individual strategies for survival. The correlation between competitive strategies and productivity are imperfect at best. For instance, in a given habitat type, large trees on one site may draw on a deep water table and grow better than the same species on another site, or grow relatively better than associated tree seedlings and undergrowth which depend on moisture close to the surface.

5. Where a more accurate estimate of productivity is needed for local areas, we recommend taking additional site-index samples.

6. It has been suggested that productivity estimates for habitat types could be made more predictive by incorporating classifications of soils, topography, or climate. To a limited extent, climatic or geographic differences have been recognized and accounted for, as in the east-west (of Continental Divide) dichotomy of the Montana classification (Pfister and others 1977) and in the partitioning of Idaho into several physiographic regions (Steele and others 1981). Productivity (site indices and yield capability) seems to vary significantly within the same habitat type between east and west side Montana sites. Also, a number of habitat types common to central Idaho, Montana, and our study area show higher productivities in central Idaho. Differences in productivity within a habitat type due to topography, soils, or parent material are apparent in some local areas. Here again if accurate estimates are needed locally, one could stratify sites, for example, by parent materials (calcareous versus noncalcareous). But, because of the limitations of existing site index curves and yield tables, further refinements of productivity data for large areas would benefit more from increased precision in methods of measuring productivity.

7. The yield of natural stands by habitat type could be estimated more precisely by direct measurements of volume growth, rather than by using site index to enter a yield table based on averages. This approach would require analysis of existing timber inventory plots representing maximum growth potential or new field measurements.

8. Stand growth models (Stage 1973, 1975) utilize growth coefficients based on habitat types. These models add a new dimension to yield prediction, provide the basis for developing managed-stand yield tables, and should eventually improve our knowledge of productivity within and between habitat types.

Zonal Relationships of Habitat Types

Just as individual species occur in a predictable sequence with changing environments, h.t.'s also display predictable patterns in local areas. On a larger scale, the sequence of h.t.'s will vary through additions or omissions, but their relative positions should remain constant. Thus *Pseudotsuga* h.t.'s normally occur in warmer and drier environments than *Abies lasiocarpa* h.t.'s, but *Picea* h.t.'s may occur between the two series or may be absent. This rule applies to patterns of individual h.t.'s and phases as well as series.

In order to demonstrate the relative positions of eastern Idaho-western Wyoming h.t.'s, schematic diagrams (figs. 32–37) are presented for characteristic localities. These diagrams are frustrated by the difficulty of depicting a three-dimensional landscape or a multidimensional environment in two dimensions, and so, are not literally accurate. Also, the number of h.t.'s in any given transect may vary from the general diagram for that particular area. Note particularly that habitat types of alluvial benches or lands bordering stream bottom-lands are largely omitted. Nevertheless, they do present a generalized concept of habitat type zonation in different geographic areas.

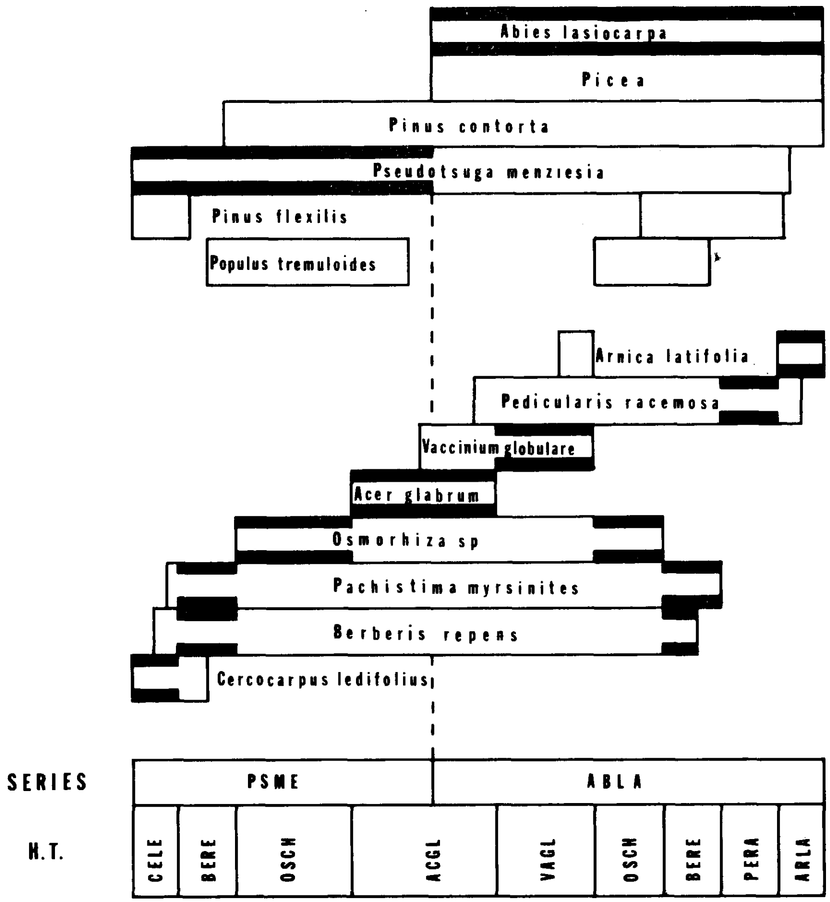


Figure 32.—General relationship of forest vegetation near Soda Springs, Idaho.

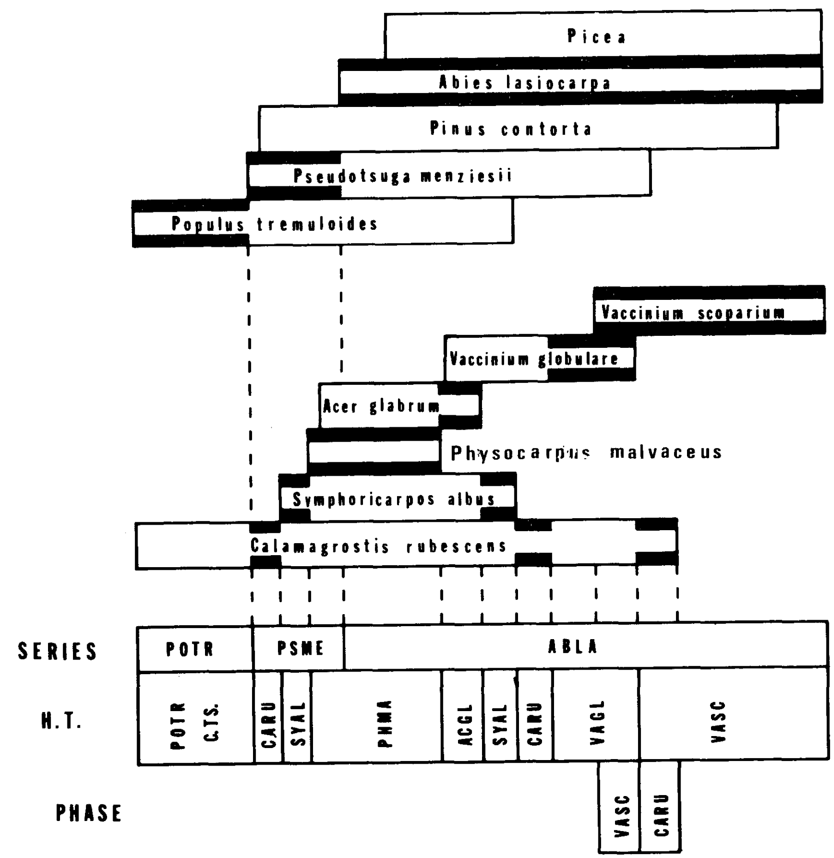


Figure 33.—General relationship of forest vegetation near Alpine, Wyoming.

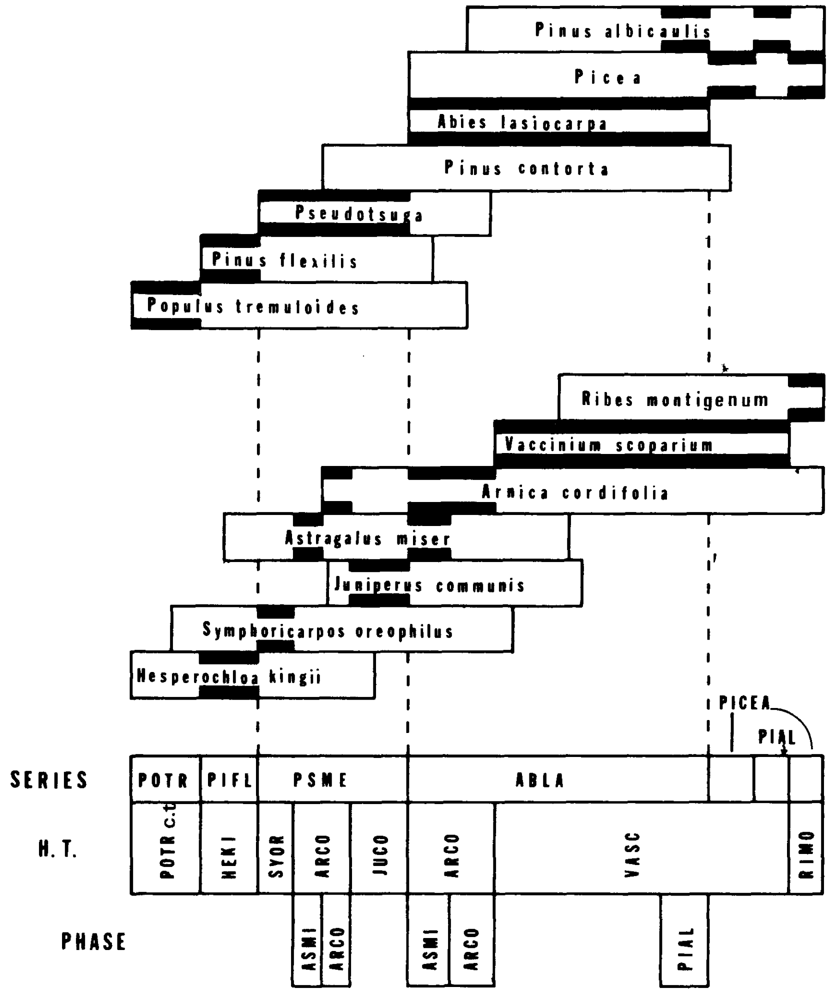


Figure 34.—General relationship of forest vegetation near Pinedale, Wyoming.

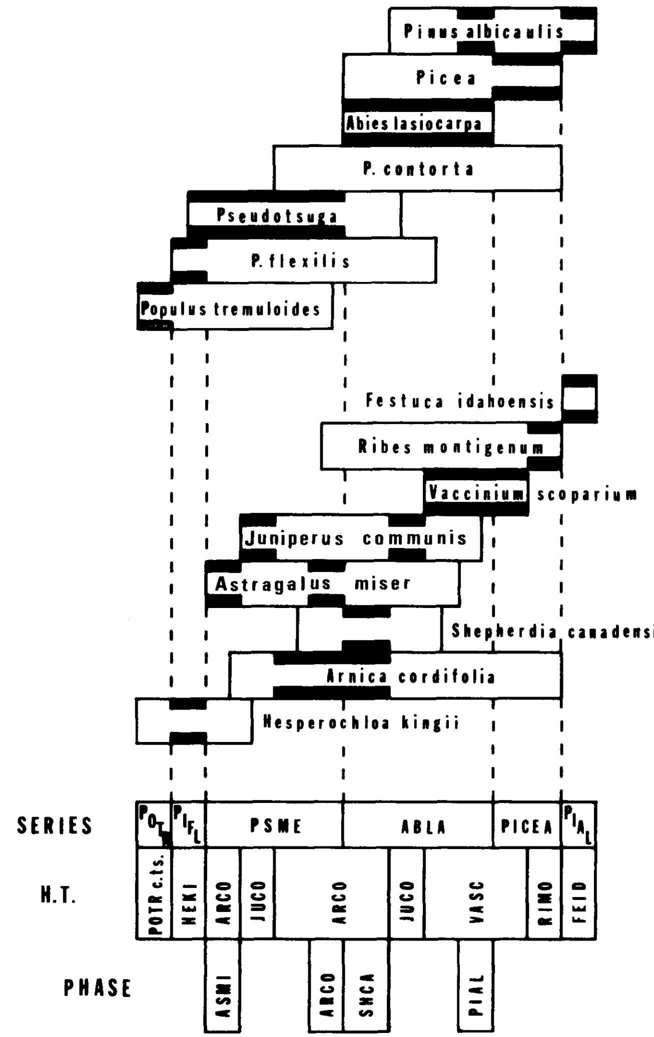


Figure 35.—General relationship of forest vegetation in the Wind River Range near Dubois, Wyoming.

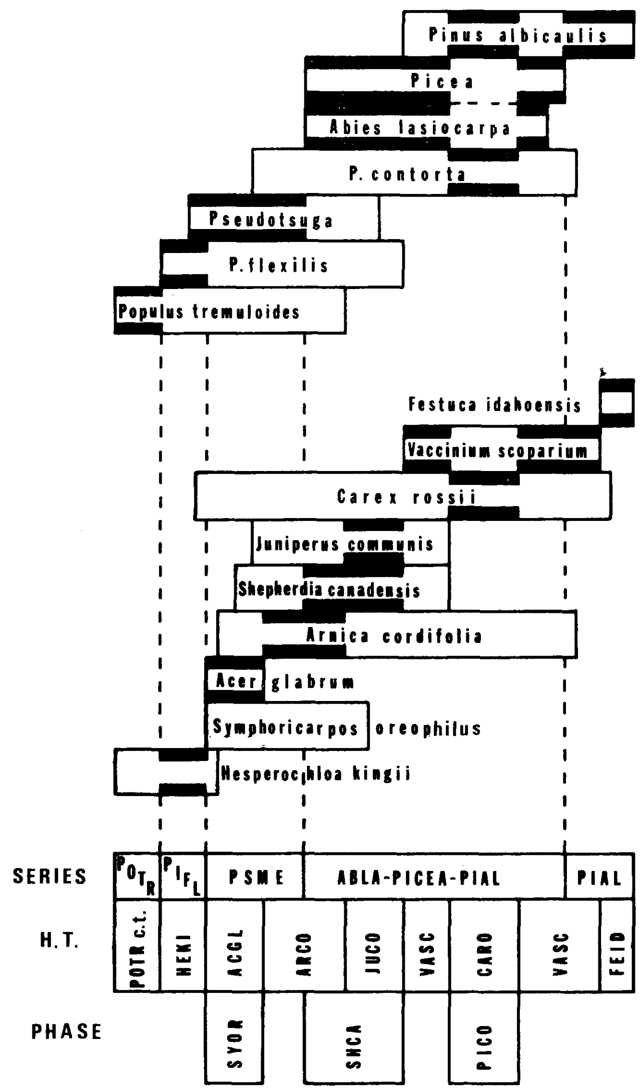


Figure 36.—General relationship of forest vegetation near Lander, Wyoming.

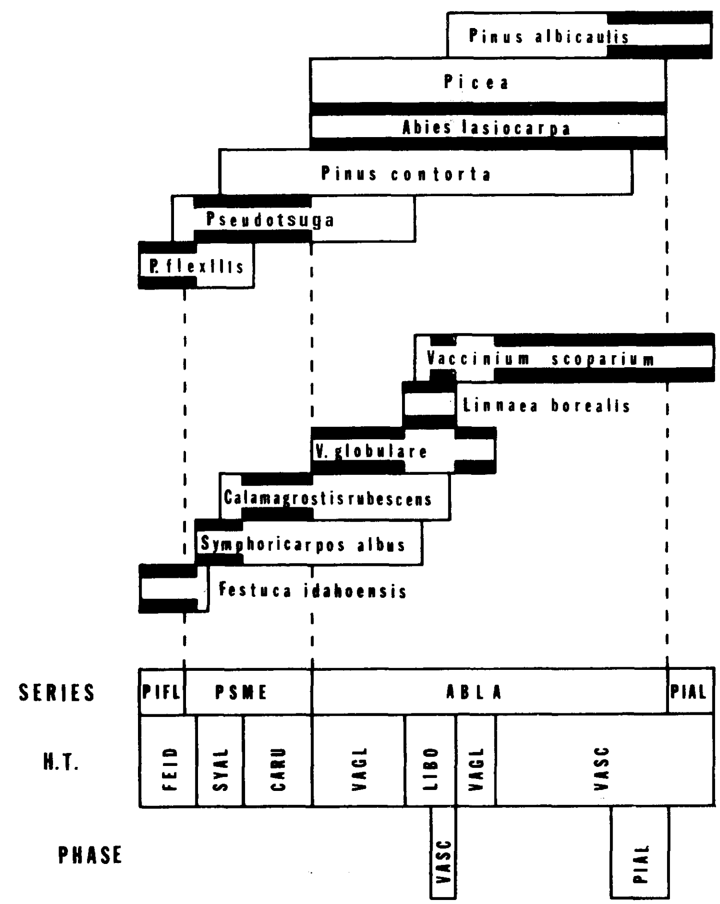


Figure 37.—General relationship of forest vegetation west of Cody, Wyoming.

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Relationship to Previous Habitat Type Classifications in the Study Area

As in any classification procedure, increased accuracy is obtained through a series of approximations, with each step adding refinement (Poore 1962). This classification offers several refinements to the pioneering work of Reed (1969, 1976) and Cooper (1975) in our study area. It also represents a few revisions to the preliminary classifications for this area (Steele and others 1974 unpubl., 1977 unpubl., 1979 unpubl.; Henderson and others 1976 unpubl.) Figure 38 illustrates the relationships of these classifications in terms of the variation encompassed by each h.t. and phase.

USE OF THE CLASSIFICATION

Validation

This classification attempts to provide a natural stratification of forest lands in terms of potential vegetational development. It is designed to reflect the combined forces of the environment upon a given site and discounts the temporary alterations of disturbance. Although the actual environmental parameters of a vegetal unit are often unknown, the major importance of this classification lies in the knowledge of the relative positions of the vegetal units. As R. and J. Daubenmire (1968) have pointed out "...that system may be considered the closest to a natural one that allows the most predictions about a unit from a mere knowledge of its position in the system".

This classification reflects about 6 years of sampling various portions of the study area, developing preliminary drafts for some of these areas, and field testing by foresters. Suggested revisions were analyzed and often incorporated. These inputs have substantially improved the classification but since this classification was developed through a series of approximations, it should always remain open to further refinement.

Use of Habitat Types

Layser (1974) and Pfister (1976) have outlined potential values of habitat types in resource management. Perhaps the most important use is a land stratification system—designating land areas with approximately equivalent environments or biotic potential—thereby providing a tool for cataloging research results, administrative study results, accumulated field observations, and intuitive evaluations. The habitat type classification provides a basis for predicting the response of vegetation to management related activities. One caution, however, is that habitat types are **not** a panacea for all decisionmaking or interpretations. Habitat types **will** complement information on existing vegetation soils, outdoor recreation, socioeconomic conditions, hydrology, and wildlife, and will aid development of more intensive land-management planning and practices. They do not provide a substitute for maps or classifications of existing vegetation, such as forest cover types.

Some of the current and potential uses of habitat types include:

1. Communication—provide a common framework for site recognition and interdisciplinary activities.

2. Timber management—stratification of seed source, species selection for planting, cutting and regeneration methods, assessing relative timber productivity.

3. Range and wildlife management—assessing relative forage production and wildlife habitat values.

4. Watershed—estimating relative plant available moisture levels and evapotranspiration rates; recognizing areas of heavy snowpack, high water tables, etc.

5. Recreation—assessing suitability for various types of recreational use, impacts of recreational use on the plant communities and sites, and esthetic recovery rates following stand disturbances.

6. Forest protection—categorization of fuel buildup, fuel management, and the natural role of fire (frequency and intensity of burns); assessment of susceptibility to various insects and diseases.

7. Natural area preservation—help insure that the environmental spectrum is adequately represented in research natural areas.

8. Research—stratification tool for designing studies; reporting results in a format suitable for appropriate extrapolation.

Some management implications are discussed in the descriptions of the habitat types in this report. The appendix data can provide additional implications through interpretation by appropriate specialists. Field personnel can also document repeated observations to help expand our knowledge of the vegetation reactions on specific habitat types.

Wind River Mtns. Reed 1969	S. Sawtooth N.F. (in) Steele and others 1974 unpubl.	N. W. Wyoming & adj. Montana & Idaho. Cooper 1975	Wind River Mtns. Reed 1976	N. W. Utah & adj. Idaho. Henderson and others 1976 unpubl.	E. Idaho-W. Wyoming Preliminary classification. Steele and others 1977	E. Idaho-W. Wyoming Forest Habitat Types Steele and others 1979	E. Idaho-W. Wyoming Forest Habitat Types.
					PIFL/HEKI	PIFL/HEKI	PIFL/HEKI
PSME/SYOR(in part)		PSME-PIFL/HEKI(in part)	PSME/SYOR(in part)		PIFL/FEID, FEID	PIFL/FEID, FEID	PIFL/FEID,FEID
				PIFL/ARTR(in part) PIFL/CELE	PIFL/CELE	PIFL/CELE	PIFL/CELE
PSME/SYOR(in part)			PSME/SYOR(in part)		PIFL/JUCO	PIFL/JUCO	PIFL/JUCO
	PSME/SYOR, PRVI(in part) PSME/SYOR, SYOR	PSME/SYAL,SYAL(in part)			PSME/SYOR	PSME/SYOR	PSME/SYOR
PSME/SYOR(in part)			PSME/SYOR(in part)		PSME/ARCO,ARCO	PSME/ARCO,ARCO	PSME/ARCO,ARCO
					PSME/ARCO,ASMI	PSME/ARCO,ASMI	PSME/ARCO,ASMI
	PSME/CELE	PSME-PIFL/HEKI(in part)		PSME/CELE	PSME/CELE	PSME/CELE	PSME/CELE
PSME/SYOR(in part)		PSME/SYAL,SYAL(in part)	PSME/SYOR(in part)		PSME/JUCO(in part)	PSME/JUCO	PSME/JUCO
	PSME/SYOR, PRVI(in part)				PSME/BERE(in part)	PSME/BERE,SYOR	PSME/BERE,SYOR
PSME/SYOR(in part)					PSME/JUCO(in part)	PSME/BERE,JUCO	PSME/BERE,JUCO
	PSME/BERE	PSME/VAGL(in part) PSME/SYAL,SYAL(in part)	PSME/SYOR(in part)	PSME/BERE	PSME/BERE(in part)	PSME/BERE,BERE	PSME/BERE,BERE
	PSME/CARU, BERE	PSME/SYAL,CARU(in part) PSME/CARU(in part)		PSME/CARU	PSME/CARU,PAMY	PSME/CARU,PAMY	PSME/CARU,PAMY
	PSME/CARU, CARU	PSME/SYAL,CARU(in part)			PSME/CARU,CARU	PSME/CARU,CARU	PSME/CARU,CARU
					PSME/SPBE,CARU	PSME/SPBE,CARU	PSME/SPBE,CARU
					PSME/SPBE,SPBE	PSME/SPBE,SPBE	PSME/SPBE,SPBE
	PSME/OSCH	PSME/SYAL,SYAL(in part)		PSME/OSCH	PSME/OSCH	PSME,OSCH	PSME,OSCH
					(eastern PSME/SYAL variant)	PSME/SYAL,SYAL	PSME/SYAL,SYAL
		PSME/VAGL(in part)			PSME/VAGL	PSME/VAGL,VAGL	PSME/VAGL,VAGL
PSME/SYOR(in part)			PSME/SYOR(in part)		PSME/ACGL,SYOR	PSME/ACGL,SYOR	PSME/JUCO PSME/BERE,JUCO
		PSME/VAGL(in part)		PSME/ACGL	PCME/ACGL,PAMY	PSME/ACGL,PAMY	PSME/ACGL,PAMY
	PSME/PHMA	PSME/PHMA		PSME/PHMA	(eastern PSME/PHMA variant)	PSME/PHMA,PAMY	PSME/PHMA,PAMY
						PSME/PHMA,PSME	PSME/PHMA,PSME
					PIEN/HYRE	PICEA/HYRE	PIEN/HYRE
						PICEA/ARCO	PIEN/ARCO
ABLA/PYSE(in part)			ABLA/PONE(in part)		PIEN/RIMO	PICEA/RIMO	PIEN/RIMO
						PICEA/JUCO	PIEN/JUCO
PIEN/VASC(in part)			PIEN/VASC(in part)		PIEN/VASC	PICEA/VASC	PIEN/VASC
		PICEA-ABIES/LIBO			PIEN/LIBO	PICEA/LIBO	PIEN/LIBO
		PICEA-ABIES/GATR			PIEN/GATR	PICEA/GATR	PIEN/GATR
					PIEN/CADI	PICEA/CADI	PIEN/CADI
						PICEA/CALE	PIEN/CALE
		PICEA/EQAR			PIEN/EQAR	PICEA/EQAR	PIEN/EQAR

(con.)

Wind River Mtns. Reed 1969	S. Sawtooth N.F. (in) Steele and others 1974 unpubl.	N. W. Wyoming & adj. Montana & Idaho Cooper 1975	Wind River Mtns. Reed 1976	N. W. Utah & adj. Idaho. Henderson and others 1976 unpubl.	E. Idaho-W.Wyoming Preliminary classification. Steele and others 1977	E.Idaho-W. Wyoming Forest Habitat Types Steele and others 1979	E. Idaho-W. Wyoming Forest Habitat Types.
		ABLA/CACA			ABLA/CACA, CACA	ABLA/CACA, CACA	ABLA/CACA,CACA
				ABLA/ACGL(in part)	ABLA/ACRU	ABLA/ACRU	ABLA/ACRU
				ABLA/PHMA	ABLA/PHMA	ABLA/PHMA	ABLA/PHMA
				ABLA/ACGL(in part)	ABLA/ACGL,PAMY	ABLA/ACGL,PAMY	ABLA/ACGL,PAMY
ABLA/PYSE(in part)		PICEA-ABIES/LIBO			ABLA/LIBO,VASC	ABLA/LIBO,VASC	ABLA/LIBO,VASC
					ABLA/LIBO, LIBO	ABLA/LIBO,LIBO	ABLA/LIBO,LIBO
		ABLA/VAGL		ABLA/VAGL	ABLA/VAGL, VASC	ABLA/VAGL,VASC	ABLA/VAGL,VASC
					ABLA/VAGL,PAMY	ABLA/VAGL,PAMY	ABLA/VAGL,PAMY
					ABLA/VAGL,VASC	ABLA/VAGL,VAGL	ABLA/VAGL,VAGL
		ABLA/VASC,PICO			ABLA/VASC,CARU	ABLA/VASC,CARU	ABLA/VASC,CARU
PIAL-PIFL/PODI(in part)		ABLA/VASC,PIAL	PIAL/VASC(in part)				ABLA/VASC,PIAL
PIEN/VASC(in part) ABLA/PYSE(in part)		ABLA/VASC,PICO	PIEN/VASC(in part) ABLA/PONE(in part	ABLA/VASC	ABLA/VASC,VASC	ABLA/VASC,VASC	ABLA/VASC,VASC
				ABLA/ARLA	ABLA/ARLA	ABLA/ARLA	ABLA/ARLA
					ABLA/SYAL	ABLA/SYAL	ABLA/SYAL
ABLA/PYSE(in part)			ABLA/PONE(in part)		ABLA/THOC	ABLA/THOC	ABLA/THOC
	ABLA/OSCH	ABLA/THOC,THOC		ABLA/OSCH	ABLA/OSCH,PAMY	ABLA/OSCH,PAMY	ABLA/OSCH,PAMY
					ABLA/OSCH,OSCH	ABLA/OSCH,OSCH	ABLA/OSCH,OSCH
		ABLA/VAGL,SPBE			ABLA/SPBE	ABLA/SPBE	ABLA/SPBE
	ABLA/CARU,BERE	ABLA/CARU		ABLA/CARU	ABLA/CARU,PAMY	ABLA/CARU,PAMY	ABLA/CARU,PAMY
	ABLA/CARU,CARU				ABLA/CARU,CARU	ABLA/CARU,CARU	ABLA/CARU,CARU
PSME/SYOR(in part)	ABLA/BERE	ABLA/THOC,ARCO ABLA/VAGL,SPBE	PSME/SYOR(in part)	ABLA/BERE	ABLA/BERE	ABLA/BERE	ABLA/BERE,BERE
ABLA/PYSE(in part)			ABLA/PONE(in part)		ABLA/JUCO	ABLA/JUCO	ABLA/JUCO
	ABLA/RIMO			ABLA/RIMO	ABLA/RIMO	ABLA/RIMO	ABLA/RIMO,RIMO
				ABLA/PERA	ABLA/PERA	ABLA/PERA	ABLA/PERA
ABLA/PYSE(in part)		ABLA/THOC,ARCO	ABLA/PONE(in part)		ABLA/ARCO,ARCO	ABLA/ARCO,PIEN	ABLA/ARCO,PIEN
					ABLA/ARCO,ASMI	ABLA/ARCO,SHCA	ABLA/ARCO,SHCA
						ABLA/ARCO,ASMI	ABLA/ARCO,ASMI
					ABLA/ARCO,ARCO	ABLA/ARCO,ARCO	ABLA/ARCO,ARCO
	ABLA/CARO			ABLA/CARO	ABLA/CARO	ABLA/CARO	ABLA/CARO
							ABLA/RIMO,PIAL
PIAL-PIFL/PODI(in part)		PIAL/VASC	PIAL/VASC(in part)			PIAL/VASC	PIAL/VASC
		PIAL/CAGE(in part)				PIAL/CAGE	PIAL/CAGE
						PIAL/JUCO,SHCA	PIAL/JUCO,SHCA
PICO communities			PICO/PONE		PIAL h.t.s.	PIAL/JUCO,JUCO	PIAL/JUCO,JUCO
		PIAL/CAGE,PICO(in part)				PIAL/CARO,PICO	PIAL/CARO,PICO
PIAL-PIFL/PODI(in part)		PIAL/CAGE,PIAL(in part)	PIAL/VASC(in part)			PIAL/CARO,CARO	PIAL/CARO,CARO
						PIAL/FEID	PIAL/FEID

Figure 38.—Relationship to previous habitat type classification in eastern Idaho-western Wyoming.

Mapping

Habitat type maps have become an important management tool in the Northern Region of the USDA Forest Service (Deitschman 1973; Stage and Alley 1973; Daubenmire 1973). They provide a permanent record of habitat type distribution on the landscape and a basis for acreage estimates for land management.

Maps may be made at various scales and degrees of accuracy, depending upon objectives. For activities such as research studies and project planning, maps should be accurate and detailed; each phase of a habitat type should be delineated, especially for research studies. The map scale should range from 4 to 8 inches per mile. At broader levels of planning such as National Forests, map accuracy and detail may be less and mapping efforts may be less extensive. Habitat types are often the finest subdivisions shown, and map scale can range from 1/2 to 2 inches per mile.

Still broader levels of mapping may be required for regional needs (selection of powerline corridors, State or regional planning); these may employ scales of 1/4 to 1/2 inch per mile, and may depict only habitat type groups or series. These should be synthesized from more detailed habitat type maps whenever the latter are available.

Selecting a mapping approach and appropriate scale to produce an acceptable map must be based on the following: (1) anticipated use of the map, (2) accuracy level required, (3) availability of adequately trained personnel, and (4) amount of time and financial support available to achieve the specified accuracy level.

At scales of 4 to 8 inches per mile, the habitat types or phases are useful as the mapping units, accepting inclusions (up to 15 percent) of other types too small to map separately. In complex topography and at smaller map scales, special mapping units must be developed, which may be called "complexes" or "mosaics". Such mapping unit complexes must be defined for each area being mapped, rather than on a preconceived grouping. The amount and relative positions of habitat types and phases within a complex must be specified because the management interpretations of a mapping unit are tied to the taxonomic units—series, habitat type, and phase.

Regardless of the mapping scale used, any field reconnaissance should identify stands to the phase level. Later, the phases can be grouped to accommodate specific purposes of the map, but broader mapping units cannot be refined after the field work is completed. The amount and location of field reconnaissance should also be specified on the map or in a report for users of the map. Finally, the map accuracy should be estimated and checked to maintain quality control in management application.

Grouping

Because this classification system for potential vegetation is hierarchical, it can be used at various levels of differentiation for various purposes. Collecting and recording of field data (vegetation inventories) should be done with enough detail to allow for determination of habitat type and phase and should be recorded in a standard format such as a checklist (appendix F). Using this approach is only slightly more time-consuming than taking cruder field data, and it enhances the value of the data as well as the comprehension of the investigator and his professional credibility. Above all, it provides flexibility in the ultimate use of the data. In contrast, if data are collected at the habitat type group level, rearrangement, or more detailed analysis is not possible.

In a given forested area, only a small percentage of all the forest habitat types and phases will occur. Moreover, some of these will be so minor in extent or so poorly developed that once their presence is documented they need not enter into most broad scale forest management considerations. This leaves a relatively small number of habitat types to be identified (and mapped) as such. After the distribution patterns of all the habitat types in a given area are identified, the types can be arranged in logical categories to facilitate resource planning and public presentations.

Many h.t.'s and phases can be grouped according to similar ecologic and geographic characteristics. Some of these groups have similar stand structure or edaphic characteristics. Others have similar responses to disturbance (tall seral shrubs) or similar timber productivities on a local basis. Where management implications are similar, it may be desirable to consider an entire series, such as the *Pinus flexilis* series as one group. Conversely, where management considerations contrast strongly even at the phase level, as in the phases of *PSME/BERE*, it may be desirable to split a habitat type in the grouping process. One example of grouping based on similar ecologic and geographic characteristics is the following:

PINUS FLEXILIS Series

PSME/SYOR; PSME/BERE, SYOR phase

PSME/ARCO; PSME/JUCO; PSME/BERE, JUCO phase

PSME/BERE, CAGE phase; PSME/CARU, CARU phase; PSME/SPBE, CARU phase

PSME/SPBE, SPBE phase; PSME/SYAL, SYAL phase

PSME/ACGL, PAMY phase; PSME/PHMA, PAMY phase, ABLA/ACGL; ABLA/PHMA

PIEN/HYRE; PIEN/ARCO; PIEN/JUCO

PIEN/CADI; PIEN/CALE; PIEN/EQAR

ABLA/LIBO; ABLA/VAGL

ABLA/OSCH; ABLA/BERE

ABLA/CACA, ABLA/STAM

ABLA/JUCO; ABLA/ARCO, ARCO phase

ABLA/VASC, CARU phase; ABLA/CARU

ABLA/VASC, PIAL phase; PIEN/VASC; PIAL/VASC

PIAL/JUCO; PIAL/CARO

Other bases for groupings may be useful for various specialists in resource management. Again, it is important to clarify that such groupings, if used at all in preference to habitat types alone, should be made only **after** a thorough inventory has been completed at the habitat type level. Any group category used should include a record of the relative amounts of each habitat type (or phase) included therein to document the basis for general statements about the grouping.

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APPENDIX A. NUMBER OF SAMPLE STANDS BY HABITAT TYPE, PHASE AND VICINITY IN EASTERN IDAHO-WESTERN WYOMING[1]

ST = Sawtooth National Forest
C = Caribou National Forest
BT = Bridger-Teton National Forest
T = Targhee National Forest

TP = Teton National Park
YP = Yellowstone National Park
SH = Shoshone National Forest
WR = Wind River Reservation

	VICINITY								
HABITAT TYPE, PHASE	ST	C	BT	T	TP	YP	SH	WR	TOTAL
***PINUS FLEXILIS* SERIES**									
PIFL/HEKI	.	.	3	.	.	.	12	7	22
PIFL/FEID, FEID	.	.	1	.	.	.	1	1	3
PIFL/CELE	.	3	.	.	.	.	.	.	3
PIFL/JUCO	.	.	.	.	.	.	4	2	6
									34
***PSEUDOTSUGA MENZIESII* SERIES**									
PSME/SYOR	.	.	8	1	.	1	1	3	14
PSME/ARCO, ARCO	.	.	7	.	.	1	3	10	21
PSME/ARCO, ASMI	.	.	1	.	.	.	.	2	3
PSME/CELE	.	5	1	2	.	.	.	.	8
PSME/JUCO	.	.	2	1	.	1	5	12	21
PSME/BERE, SYOR	.	3	.	.	.	.	.	.	3
PSME/BERE, JUCO	.	.	2	.	.	.	2	2	6
PSME/BERE, BERE	4	15	3	.	.	.	2	.	24
PSME/CARU, PAMY	5	5	1	2	.	.	.	.	13
PSME/CARU, CARU	2	4	5	11	.	5	.	.	27
PSME/SPBE, CARU	.	.	1	6	2	.	1	.	10
PSME/SPBE, SPBE	.	.	2	3	1	2	1	.	9
PSME/OSCH	4	16	.	4	.	.	.	.	24
PSME/SYAL, SYAL	.	.	7	4	.	3	4	.	18
PSME/VAGL, VAGL	.	.	.	3	.	.	.	.	3
PSME/ACGL, PAMY	.	13	2	7	1	.	1	1	25
PSME/PHMA, PAMY	3	4	6	4	.	.	.	.	17
PSME/PHMA, PSME	.	.	.	.	.	1	4	.	5
									251
***PICEA ENGELMANNII* SERIES**									
PIEN/HYRE	.	.	.	.	.	1	3	7	11
PIEN/ARCO	.	.	.	.	.	.	5	12	17
PIEN/RIMO	.	.	2	.	.	.	1	2	5
PIEN/JUCO	.	.	1	.	.	.	3	17	21
PIEN/VASC	.	.	7	.	.	.	2	4	13
PIEN/LIBO	.	.	1	.	.	4	3	.	8
PIEN/GATR	.	.	2	1	.	1	4	.	8
PIEN/CADI	.	.	1	1	.	.	2	.	4
PIEN/CALE	.	.	2	.	.	.	2	6	10
PIEN/EQAR	.	.	6	1	.	.	3	.	10
									107

(con.)

APPENDIX A (con.)

HABITAT TYPE, PHASE	VICINITY ST	C	BT	T	TP	YP	SH	WR	TOTAL
***ABIES LASIOCARPA* SERIES**									
ABLA/CACA, CACA	.	.	1	1	.	1	1	.	4
ABLA/ACRU	.	3	9	2	2	2	.	.	18
ABLA/PHMA	.	2	5	1	.	.	.	.	8
ABLA/ACGL, PAMY	.	13	3	7	.	.	.	.	23
ABLA/LIBO, VASC	.	.	6	.	.	4	1	.	11
ABLA/LIBO, LIBO	.	.	7	.	.	2	6	.	15
ABLA/VAGL, VASC	.	.	5	2	.	3	.	.	10
ABLA/VAGL, PAMY	.	22	10	11	7	1	.	.	51
ABLA/VAGL, VAGL	.	.	.	1	2	1	.	.	4
ABLA/VASC, CARU	.	1	4	.	.	.	.	.	5
ABLA/VASC, PIAL	.	.	9	1	2	5	10	.	27
ABLA/VASC, VASC	.	4	39	1	.	5	7	5	61
ABLA/ARLA	.	17	1	1	.	1	1	.	21
ABLA/SYAL	.	1	8	2	.	.	.	.	11
ABLA/THOC	.	.	5	4	.	6	.	1	16
ABLA/OSCH, PAMY	.	6	3	.	.	.	.	.	9
ABLA/OSCH, OSCH	8	15	.	.	.	.	.	.	23
ABLA/SPBE	.	1	7	2	1	.	.	.	11
ABLA/CARU, PAMY	1	2	1	2	.	.	.	.	6
ABLA/CARU, CARU	3	6	6	.	.	1	.	.	16
ABLA/BERE, BERE	3	30	13	1	.	.	1	.	48
ABLA/JUCO	.	.	1	.	.	.	6	1	8
ABLA/RIMO, RIMO	4	.	4	1	.	.	1	.	10
ABLA/RIMO, PIAL	.	.	8	.	.	.	.	.	8
ABLA/PERA	.	10	7	1	.	.	.	.	18
ABLA/ARCO, PIEN	.	.	7	.	.	.	5	.	12
ABLA/ARCO, SHCA	.	.	3	.	.	.	5	2	10
ABLA/ARCO, ASMI	.	.	6	.	.	.	5	.	11
ABLA/ARCO, ARCO	.	1	14	1	.	.	.	1	17
ABLA/CARO	3	.	1	.	.	.	.	.	4
									496
***PINUS ALBICAULIS* SERIES**									
PIAL/VASC	.	.	3	.	1	1	2	2	9
PIAL/CAGE	.	.	.	2	.	1	.	.	3
PIAL/JUCO, SHCA	.	.	.	.	.	.	3	.	3
PIAL/JUCO, JUCO	.	.	2	.	.	.	2	11	15
PIAL/CARO, PICO	.	.	2	1	.	4	9	1	17
PIAL/CARO, CARO	.	.	.	.	.	1	.	2	3
PIAL/FEID	.	.	.	.	.	.	1	2	3
									53
Unclassified Stands	1	2	14	2	.	4	10	7	40
									40
Total	41	204	288	98	19	63	145	123	981

[1]h.t. descriptions may reference locations based on reconnaissance data not included in this table.

APPENDIX B. OCCURRENCE AND ROLES OF TREE SPECIES BY HABITAT TYPES

Occurrence of tree species by habitat type, showing successional status as interpreted from eastern Idaho and western Wyoming reconnaissance plot data.

C = major climax species | **S = major seral species** | **a = accidental**
c = minor climax species | **s = minor seral species** | **( ) = only in certain areas of h.t.**

HABITAT TYPE, PHASE	POTR	JUSC	PIFL	PSME	PICO	PIPU	PIEN	ABLA	PIAL
PIFL/HEKI	a	(c)	C	C	a	.	.	.	.
PIFL/FEID, FEID	.	(c)	C	C	.	.	.	.	.
PIFL/CELE	.	(c)	C	C	.	.	.	.	.
PIFL/JUCO	.	a	C	C	(c)	.	a	.	.
PSME/SYOR	a	(c)	(c)	C	.	.	.	.	.
PSME/ARCO, ARCO	a	(s)	s	C	(s)	.	a	.	.
PSME/ARCO, ASMI	a	(s)	s	C	a	.	.	.	.
PSME/CELE	.	(C)	(c)	C	.	.	.	.	.
PSME/JUCO	a	(s)	s	C	(s)	.	a	a	.
PSME/BERE, SYOR	.	a	a	C	.	.	.	.	.
PSME/BERE, JUCO	S	.	s	C	S	.	.	.	.
PSME/BERE, BERE	(S)	(s)	(s)	C	(S)	.	.	a	.
PSME/CARU, PAMY	(S)	a	a	C	(S)	.	.	a	.
PSME/CARU, CARU	(S)	a	(s)	C	(S)	.	.	a	.
PSME/SPBE, CARU	a	.	a	C	(S)	.	.	.	.
PSME/SPBE, SPBE	.	a	(s)	C	(s)	.	a	.	a
PSME/OSCH	S	a	.	C	(S)	.	.	a	.
PSME/SYAL, SYAL	(S)	(s)	(s)	C	(S)	a	a	a	.
PSME/VAGL, VAGL	.	.	.	C	S	.	.	.	.
PSME/ACGL, PAMY	(s)	a	a	C	(s)	.	.	a	.
PSME/PHMA, PAMY	a	s	(s)	C	.	.	.	.	.
PSME/PHMA, PSME	.	.	a	C	.	.	a	.	.
PIEN/HYRE	.	.	(s)	(S)	a	.	C	a	(s)
PIEN/ARCO	(s)	.	(s)	(S)	(S)	.	C	a	(s)
PIEN/RIMO	.	.	(s)	.	(S)	.	C	a	(s)
PIEN/JUCO	a	.	(s)	(S)	(S)	.	C	a	(s)
PIEN/VASC	.	.	(s)	.	(S)	.	C	c	(S)
PIEN/LIBO	.	.	.	(S)	S	.	C	.	a
PIEN/GATR	.	.	.	s	s	(S)	C	c	.
PIEN/CADI	a	.	.	.	.	(S)	C	c	.
PIEN/CALE	.	.	a	.	s	.	C	c	s
PIEN/EQAR	a	.	.	.	s	(S)	C	c	.

(con.)

APPENDIX B (con.)

HABITAT TYPE, PHASE	POTR	JUSC	PIFL	PSME	PICO	PIPU	PIEN	ABLA	PIAL
ABLA/CACA, CACA	.	.	a	.	S	.	S	C	a
ABLA/ACRU	a	.	.	(S)	s	(s)	S	C	a
ABLA/PHMA	(s)	.	a	S	a	.	s	C	.
ABLA/ACGL, PAMY	a	.	a	S	(s)	.	S	C	a
ABLA/LIBO, VASC	.	.	a	(s)	S	.	S	C	a
ABLA/LIBO, LIBO	(s)	a	a	(S)	S	.	S	C	a
ABLA/VAGL, VASC	.	.	a	a	S	.	S	C	s
ABLA/VAGL, PAMY	.	.	a	s	S	.	S	C	(s)
ABLA/VAGL, VAGL	.	.	.	S	S	.	S	C	(s)
ABLA/VASC, CARU	a	.	.	s	S	.	a	C	a
ABLA/VASC, PIAL	.	.	.	a	S	.	S	C	C
ABLA/VASC, VASC	.	.	a	(s)	S	.	S	C	s
ABLA/ARLA	(S)	.	a	(S)	(S)	.	S	C	(S)
ABLA/SYAL	(S)	a	a	S	S	.	S	C	.
ABLA/THOC	(S)	.	a	S	S	.	S	C	s
ABLA/OSCH, PAMY	(S)	a	(s)	S	(S)	.	s	C	(s)
ABLA/OSCH, OSCH	(S)	.	.	S	(S)	.	s	C	.
ABLA/SPBE	.	.	.	S	S	.	s	C	.
ABLA/CARU, PAMY	(S)	.	a	S	(S)	.	(s)	C	.
ABLA/CARU, CARU	(S)	.	a	(S)	S	.	(s)	C	.
ABLA/BERE	(S)	.	s	S	(S)	.	(S)	C	.
ABLA/JUCO	a	a	s	(S)	S	.	(S)	C	s
ABLA/RIMO, RIMO	.	.	a	a	(s)	.	S	C	s
ABLA/RIMO, PIAL	.	.	.	.	.	.	c	C	C
ABLA/PERA	.	.	(s)	(S)	S	.	S	C	(s)
ABLA/ARCO, PIEN	.	.	a	(s)	S	.	S	C	(s)
ABLA/ARCO, SHCA	s	.	s	s	S	.	s	C	s
ABLA/ARCO, ASMI	.	.	s	(S)	S	.	s	C	.
ABLA/ARCO, ARCO	(S)	.	s	s	S	.	s	C	(s)
ABLA/CARO	(s)	.	(s)	.	S	.	a	C	.
PIAL/VASC	.	.	.	.	C	.	c	c	C
PIAL/CAGE	.	.	.	a	(C)	.	.	a	C
PIAL/JUCO, SHCA	a	.	s	a	C	.	a	a	C
PIAL/JUCO, JUCO	s	.	s	a	C	.	a	a	C
PIAL/CARO, PICO	a	.	s	.	C	.	.	c	C
PIAL/CARO, CARO	.	.	.	.	.	.	c	a	C
PIAL/FEID	a	.	.	.	a	.	a	.	C

APPENDIX C-1

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases.

ADP NO.	SERIES	PINUS FLEXILIS				PSEUDOTSUGA MENZIESII							
	HABITAT TYPE	HEKI	FEID	CELE	JUCO	SYOR	ARCO	ARCO	CELE	JUCO	BERE	BERE	BERE
	PHASE						ARCO	ASMI			SYOR	JUCO	BERE
	NUMBER OF STANDS	n=22	n= 3	n= 3	n= 6	n=15	n-21	n= 3	n= 8	n=21	n= 3	n= 6	n=24
	TREES												
002	Abies lasiocarpa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	1 (2)
007	Picea engelmannii	+ (0)	- (0)	- (0)	3 (0)	- (0)	1 (0)	- (0)	- (0)	2 (10)	- (0)	- (0)	- (0)
008	Picea glauca	- (0)	- (0)	- (0)	2 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
022	Picea pungens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
010	Pinus contorta	1 (9)	- (0)	- (0)	7 (35)	- (0)	1 (7)	3 (0)	- (0)	2 (18)	- (0)	10 (13)	1 (15)
011	Pinus flexilis	10 (25)	10 (46)	10 (15)	10 (46)	5 (13)	5 (7)	10 (6)	3 (8)	7 (8)	3 (0)	7 (21)	2 (5)
014	Populus tremuloides	+ (1)	- (0)	- (0)	3 (2)	2 (1)	1 (2)	3 (3)	- (0)	2 (2)	- (0)	5 (15)	1 (37)
016	Pseudotsuga menziesii	8 (35)	3 (15)	10 (15)	5 (0)	10 (52)	10 (61)	10 (54)	10 (19)	10 (43)	10 (54)	10 (38)	10 (74)
	SHRUBS AND SUBSHRUBS												
102	Acer glabrum	- (0)	- (0)	- (0)	- (0)	3 (3)	2 (2)	3 (3)	1 (3)	3 (3)	- (0)	3 (5)	5 (2)
167	Acer grandidentatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	- (0)	2 (1)
104	Alnus sinuata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	- (0)	- (0)	7 (2)	- (0)	4 (2)	1 (1)	- (0)	5 (12)	2 (1)	10 (3)	5 (1)	8 (8)
201	Arctostaphylos uva-ursi	- (0)	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	- (0)	1 (3)	- (0)	3 (0)	- (0)
150	Artemisia tridentata	5 (7)	10 (1)	10 (14)	- (0)	4 (9)	1 (0)	3 (0)	6 (4)	2 (0)	7 (20)	- (0)	+ (1)
203	Berberis repens	+ (1)	- (0)	10 (5)	- (0)	6 (1)	4 (1)	- (0)	10 (8)	3 (1)	10 (11)	10 (16)	10 (15)
107	Ceanothus velutinus	- (0)	- (0)	7 (1)	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	- (0)	1 (19)
173	Cercocarpus ledifolius	- (0)	- (0)	10 (15)	- (0)	- (0)	- (0)	- (0)	10 (44)	- (0)	3 (3)	- (0)	1 (1)
204	Clematis columbiana	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	1 (2)	- (0)	- (0)	1 (1)
112	Juniperus communis	5 (1)	7 (3)	- (0)	10 (13)	3 (2)	5 (2)	7 (1)	- (0)	10 (30)	- (0)	10 (9)	2 (0)
153	Juniperus horizontalis	- (0)	- (0)	- (0)	2 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
113	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
115	Lonicera utahensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	+ (1)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	+ (1)	- (0)	7 (2)	- (0)	1 (3)	2 (1)	3 (1)	8 (4)	1 (3)	7 (31)	3 (2)	9 (17)
122	Physocarpus malvaceus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	+ (0)	- (0)	- (0)	- (0)	3 (5)	1 (0)	- (0)	6 (7)	1 (15)	3 (15)	3 (1)	6 (15)
125	Purshia tridentata	1 (6)	- (0)	3 (3)	- (0)	1 (3)	+ (1)	- (0)	- (0)	- (0)	3 (1)	2 (1)	- (0)
128	Ribes cereum	5 (2)	- (0)	- (0)	2 (1)	4 (1)	3 (1)	3 (1)	3 (1)	2 (4)	- (0)	- (0)	- (0)
158	Ribes hudsonianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
159	Ribes montigenum	+ (0)	- (0)	- (0)	- (0)	1 (3)	1 (3)	- (0)	- (0)	1 (2)	- (0)	- (0)	+ (0)
131	Ribes viscosissimum	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (2)	3 (1)	- (0)	1 (1)	- (0)	- (0)	2 (0)
132	Rosa acicularis	+ (0)	- (0)	- (0)	- (0)	1 (1)	1 (2)	- (0)	- (0)	1 (1)	- (0)	3 (0)	+ (1)
161	Rosa nutkana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)
134	Rosa woodsii	3 (1)	- (0)	- (0)	3 (0)	3 (5)	4 (3)	3 (1)	4 (3)	5 (3)	- (0)	3 (8)	5 (2)
136	Rubus parviflorus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)
137	Salix scouleriana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	0 (0)	1 (3)
139	Shepherdia canadensis	+ (1)	- (0)	3 (3)	3 (8)	1 (1)	5 (11)	3 (1)	- (0)	4 (3)	3 (1)	8 (10)	2 (2)
140	Sorbus scopulina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (2)
142	Spiraea betulifolia	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (2)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
143	Symphoricarpos albus	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	3 (3)	1 (1)	- (0)	- (0)	+ (3)
163	Symphoricarpos oreophilus	5 (2)	- (0)	10 (3)	3 (1)	9 (17)	8 (9)	7 (1)	8 (28)	7 (4)	10 (46)	7 (15)	9 (8)
145	Vaccinium caespitosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
148	Vaccinium scoparium	- (0)	- (0)	- (0)	- (0)	- (0)	+ (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	FERNS AND ALLIES												
254	Equisetum arvensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	GRAMINOIDS												
301	Agropyron spicatum	7 (6)	7 (8)	7 (3)	3 (1)	9 (6)	2 (1)	- (0)	8 (28)	2 (2)	3 (3)	- (0)	1 (1)
338	Bromus ciliatus	1 (0)	3 (1)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	5 (2)	1 (1)
304	Bromus vulgaris	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
305	Calamagrostis canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
307	Calamagrostis rubescens	- (0)	- (0)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	1 (8)	3 (1)	3 (1)	3 (2)
339	Carex disperma	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (4)
311	Carex rossii	9 (2)	3 (3)	3 (1)	10 (3)	7 (1)	3 (1)	7 (1)	3 (1)	6 (1)	3 (1)	8 (0)	4 (1)
316	Elymus glaucus	+ (3)	- (0)	- (0)	-(0)	1 (1)	1 (3)	- (0)	- (0)	1 (1)	- (0)	- (0)	2 (5)
317	Festuca idahoensis	5 (1)	10 (15)	3 (1)	- (0)	6 (5)	5 (4)	- (0)	1 (3)	1 (1)	3 (1)	8 (1)	1 (1)
348	Hesperochloa kingii	10 (17)	10 (5)	10 (7)	5 (6)	4 (2)	5 (1)	3 (1)	6 (2)	6 (2)	- (0)	- (0)	2 (1)
321	Juncus drummondii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
323	Koeleria cristata	2 (1)	3 (1)	7 (1)	3 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
325	Luzula hitchcockii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
349	Melica bulbosa	- (0)	- (0)	7 (1)	- (0)	1 (1)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	+ (1)
329	Oryzopis asperifolia	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
331	Poa nervosa	1 (3)	- (0)	7 (2)	3 (1)	4 (6)	5 (10)	- (0)	1 (3)	3 (4)	- (0)	8 (6)	5 (2)
360	Stipa occidentalis	- (0)	3 (1)	- (0)	- (0)	2 (1)	+ (15)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (5)

*Code to constancy values: + = 0- 5%, 1 = 5-15%, 2 = 15-25%, 3 = 25-35%, 4 = 35-45%, 5 = 45-55%, 6 = 55-65%, 7 = 65-75%, 8 = 75-85%, 9 = 85-95%, 10 = 95-100%

(con.)

APPENDIX C-1

APPENDIX C-1 (con.)

ADP NO.	SERIES / HABITAT TYPE / PHASE / NUMBER OF STANDS	PINUS FLEXILIS HEKI n=22	PINUS FLEXILIS FEID n= 3	PINUS FLEXILIS CELE n= 3	PINUS FLEXILIS JUCO n= 6	PSEUDOTSUGA MENZIESII SYOR n=15	PSEUDOTSUGA MENZIESII ARCO ARCO n-21	PSEUDOTSUGA MENZIESII ARCO ASMI n= 3	PSEUDOTSUGA MENZIESII CELE n= 8	PSEUDOTSUGA MENZIESII JUCO n=21	PSEUDOTSUGA MENZIESII BERE SYOR n= 3	PSEUDOTSUGA MENZIESII BERE JUCO n= 6	PSEUDOTSUGA MENZIESII BERE BERE n=24
	FORBS												
401	Achillea millefolium	3 (1)	7 (2)	7 (2)	7 (1)	5 (3)	2 (1)	- (0)	10 (1)	2 (1)	3 (1)	5 (0)	2 (1)
402	Actaea rubra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
565	Aconitum columbianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
404	Allium cernuum	4 (1)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	1 (3)	1 (0)	- (0)	- (0)	- (0)	- (0)	3 (1)	- (0)
414	Antennaria microphylla	6 (1)	7 (2)	- (0)	7 (1)	5 (1)	4 (3)	7 (43)	- (0)	4 (0)	3 (1)	5 (2)	1 (1)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
413	Antennaria racemosa	- (0)	- (0)	- (0)	2 (1)	- (0)	1 (0)	- (0)	0 (0)	1 (15)	- (0)	- (0)	- (0)
754	Aquilegia coerulea	- (0)	- (0)	- (0)	- (0)	1 (2)	3 (2)	- (0)	- (0)	- (0)	- (0)	3 (1)	2 (1)
420	Arenaria macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)
421	Arnica cordifolia	+ (1)	- (0)	- (0)	8 (2)	6 (1)	10 (23)	3 (3)	4 (14)	7 (6)	- (0)	7 (17)	8 (18)
422	Arnica latifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
426	Aster conspicuus	- (0)	- (0)	- (0)	2 (1)	1 (3)	1 (20)	- (0)	- (0)	1 (37)	- (0)	- (0)	- (0)
582	Aster engelmannii	- (0)	- (0)	3 (3)	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	3 (1)
822	Aster glaucodes	1 (1)	- (0)	- (0)	2 (1)	1 (2)	2 (2)	- (0)	3 (1)	1 (8)	- (0)	3 (3)	2 (1)
430	Astragalus miser	6 (13)	3 (3)	- (0)	7 (5)	4 (11)	4 (27)	10 (34)	- (0)	6 (18)	- (0)	3 (37)	- (0)
817	Balsamorhiza macrophylla	- (0)	- (0)	7 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)
431	Balsamothiza sagittata	5 (6)	7 (9)	10 (6)	2 (3)	4 (7)	1 (0)	- (0)	6 (9)	1 (1)	10 (1)	3 (1)	3 (1)
843	Balsamorhiza incana	+ (3)	- (0)	- (0)	2 (3)	- (0)	+ (1)	- (0)	- (0)	1 (0)	- (0)	3 (1)	- (0)
769	Caltha leptosepala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
436	Campanula rotundifolia	5 (0)	7 (1)	- (0)	5 (0)	2 (1)	2 (0)	3 (1)	1 (3)	3 (1)	- (0)	5 (0)	- (0)
438	Castilleja miniata	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
594	Castilleja rhexifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
442	Chimaphila umbellata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	2 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	6 (2)	10 (1)	3 (1)	- (0)	2 (1)	+ (1)	3 (1)	8 (3)	2 (1)	3 (1)	5 (1)	1 (2)
847	Cymopteris hendersonii	1 (2)	- (0)	- (0)	2 (1)	1 (1)	3 (3)	3 (1)	- (0)	2 (1)	- (0)	2 (1)	- (0)
455	Disporum trachycarpum	- (0)	- (0)	- (0)	- (0)	1 (1)	+ (1)	- (0)	1 (1)	1 (3)	- (0)	- (0)	3 (1)
459	Epilobium angustifolium	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	3 (1)	1 (0)
465	Fragaria vesca	+ (1)	- (0)	- (0)	2 (1)	1 (1)	1 (2)	3 (1)	1 (3)	1 (1)	3 (3)	- (0)	5 (3)
466	Fragaria virginiana	+ (1)	3 (1)	- (0)	2 (1)	1 (15)	1 (8)	- (0)	- (0)	1 (3)	- (0)	3 (1)	1 (2)
616	Frasera speciosa	1 (1)	- (0)	- (0)	2 (1)	1 (1)	4 (1)	- (0)	- (0)	1 (1)	- (0)	3 (8)	3 (0)
471	Galium triflorum	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
620	Geranium richardsonii	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (15)
473	Geranium viscosissimum	- (0)	- (0)	- (0)	- (0)	1 (3)	+ (1)	- (0)	- (0)	1 (1)	7 (1)	- (0)	1 (1)
474	Geum triflorum	+ (3)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
476	Goodyera oblongifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (0)
481	Heracleum lanatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (0)
486	Heracium gracile	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
756	Ligusticum filicinum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
639	Linum perenne	+ (1)	3 (3)	3 (3)	2 (1)	1 (1)	- (0)	- (0)	3 (8)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	1 (1)	- (0)	-* (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
649	Mitella pentandra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	5 (1)
505	Osmorhiza chilensis	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (2)	- (0)	1 (3)	1 (1)	3 (1)	- (0)	6 (2)
653	Osmorhiza depauperata	- (0)	- (0)	- (0)	2 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (1)	2 (1)
507	Pedicularis bracteosa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
509	Pedicularis racemosa	- (0)	- (0)	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)
513	Penstemon procerus	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
669	Potentilla diversifolia	1 (0)	- (0)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	- (0)	- (0)	- (0)	2 (1)	1 (1)	1 (2)	- (0)	- (0)	1 (1)	- (0)	- (0)	+ (1)
702	Potentilla ovina	1 (1)	7 (2)	- (0)	3 (1)	- (0)	+ (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
526	Pyrola asarifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	- (0)	- (0)	- (0)	2 (1)	- (0)	1 (2)	3 (1)	- (0)	2 (1)	- (0)	5 (1)	2 (2)
676	Saxifraga arguta	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
681	Senecio streptanthifolius	+ (3)	3 (3)	- (0)	5 (1)	4 (1)	2 (1)	- (0)	4 (2)	2 (1)	3 (1)	3 (1)	- (0)
539	Senecio triangularis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
541	Silene menziesii	- (0)	- (0)	- (0)	- (0)	2 (1)	+ (1)	- (0)	4 (1)	- (0)	- (0)	- (0)	4 (1)
542	Smilacina racemosa	- (0)	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	8 (1)	- (0)	- (0)	- (0)	6 (2)
543	Smilacina stellata	+ (1)	- (0)	- (0)	- (0)	1 (1)	+ (3)	- (0)	- (0)	- (0)	3 (1)	- (0)	- (0)
684	Solidago multiradiata	3 (1)	- (0)	- (0)	3 (2)	1 (2)	2 (2)	- (0)	1 (3)	2 (1)	- (0)	3 (1)	- (0)
546	Streptopus amplexifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
714	Thalictrum fendleri	- (0)	- (0)	3 (3)	- (0)	1 (1)	- (0)	- (0)	3 (0)	- (0)	3 (1)	- (0)	4 (9)
547	Thalictrum occidentale	- (0)	- (0)	- (0)	2 (0)	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)
690	Trollius laxus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
550	Valeriana dioica & occidentalis	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	- (0)
554	Viola adunca	+ (1)	- (0)	- (0)	2 (1)	1 (1)	+ (0)	- (0)	1 (1)	- (0)	3 (1)	- (0)	4 (1)
555	Viola canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
693	Viola nuttallii	- (0)	- (0)	- (0)	- (0)	1 (1)	+ (1)	- (0)	1 (1)	- (0)	3 (1)	- (0)	+ (1)
557	Viola orbiculata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	7 (1)	- (0)	1 (2)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

APPENDIX C-1

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases

ADP NO.	SERIES	PSEUDOTSUGA MENZIESII									
	HABITAT TYPE	CARU	CARU	SPBE	SPBE	OSCH	SYAL	VAGL	ACGL	PHMA	PHMA
	PHASE	PAMY	CARU	CARU	SPBE				PAMY	PAMY	PSME
	NUMBER OF STANDS	n=13	n=27	n=10	n= 9	n=24	n=18	n= 3	n=25	n=17	n= 5
	TREES										
002	Abies lasiocarpa	2 (1)	1 (1)	- (0)	- (0)	2 (1)	1 (3)	- (0)	2 (2)	1 (0)	- (0)
007	Picea engelmannii	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	6 (1)
008	Picea glauca	- (0)	- (0)	- (0)	1 (3)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)
022	Picea pungens	- (0)	- (0)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	- (0)	- (0)	- (0)	1 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
010	Pinus contorta	2 (20)	4 (16)	3 (23)	2 (9)	1 (20)	2 (8)	7 (26)	2 (21)	- (0)	- (0)
011	Pinus flexilis	1 (1)	1 (8)	1 (1)	3 (11)	- (0)	2 (9)	- (0)	2 (1)	2 (5)	4 (2)
014	Populus tremuloides	4 (14)	+ (63)	2 (2)	- (0)	5 (24)	2 (25)	- (0)	3 (15)	1 (3)	- (0)
016	Pseudotsuga menziesii	10 (58)	10 (55)	10 (66)	10 (59)	10 (68)	10 (55)	10 (38)	10 (62)	10 (59)	10 (62)
	SHRUBS AND SUBSHRUBS										
102	Acer glabrum	5 (3)	1 (0)	4 (2)	3 (3)	3 (2)	3 (1)	- (0)	8 (27)	6 (11)	2 (1)
167	Acer grandidentatum	- (0)	+ (3)	1 (1)	- (0)	1 (34)	1 (19)	- (0)	2 (14)	1 (8)	- (0)
104	Alnus sinuata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	8 (5)	3 (4)	4 (8)	4 (9)	8 (11)	6 (8)	7 (15)	8 (13)	7 (7)	2 (1)
201	Arctostaphylos uva-ursi	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)
150	Artemisia tridentata	1 (0)	2 (3)	1 (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
203	Berberis repens	9 (9)	7 (2)	8 (5)	8 (8)	8 (5)	8 (3)	- (0)	9 (6)	8 (7)	2 (1)
107	Ceanothus velutinus	2 (1)	- (0)	1 (1)	- (0)	- (0)	1 (1)	- (0)	1 (2)	- (0)	- (0)
173	Cercocarpus ledifolius	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	1 (19)	- (0)
204	Clematis columbiana	- (0)	1 (5)	1 (1)	1 (1)	+ (1)	3 (1)	3 (15)	4 (4)	2 (5)	4 (0)
112	Juniperus communis	1 (1)	1 (8)	1 (0)	4 (2)	- (0)	4 (3)	- (0)	1 (1)	1 (2)	6 (1)
153	Juniperus horizontalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
113	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
115	Lonicera utahensis	1 (3)	+ (1)	5 (1)	1 (1)	- (0)	2 (1)	10 (6)	3 (10)	3 (4)	- (0)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	10 (25)	3 (1)	4 (5)	6 (26)	5 (7)	3 (4)	3 (3)	7 (9)	10 (10)	- (0)
122	Physocarpus malvaceus	1 (1)	- (0)	1 (1)	1 (0)	+ (3)	1 (1)	- (0)	1 (2)	10 (61)	10 (53)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	7 (8)	3 (6)	4 (6)	3 (15)	5 (13)	6 (13)	- (0)	7 (8)	5 (9)	- (0)
125	Purshia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)
128	Ribes cereum	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
158	Ribes hudsonianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	+ (1)	- (0)	2 (3)
159	Ribes montigenum	- (0)	+ (1)	1 (0)	1 (1)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)
131	Ribes viscosissimum	3 (0)	1 (2)	2 (1)	1 (1)	1 (2)	1 (1)	3 (3)	4 (1)	1 (3)	- (0)
132	Rosa acicularis	- (0)	+ (1)	- (0)	- (0)	- (0)	2 (11)	- (0)	+ (3)	- (0)	- (0)
161	Rosa nutkana	2 (1)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
134	Rosa woodsii	2 (1)	1 (1)	- (0)	- (0)	3 (4)	1 (2)	- (0)	2 (2)	1 (3)	- (0)
136	Rubus parviflorus	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (2)	1 (15)	- (0)
137	Salix scouleriana	2 (9)	+ (3)	1 (3)	- (0)	1 (26)	- (0)	7 (15)	2 (3)	2 (2)	- (0)
139	Shepherdia canadensis	2 (1)	1 (2)	1 (15)	4 (0)	- (0)	2 (6)	3 (1)	1 (4)	1 (1)	8 (1)
140	Sorbus scopulina	4 (4)	+ (1)	4 (1)	1 (1)	1 (2)	1 (3)	10 (2)	5 (10)	1 (0)	- (0)
142	Spiraea betulifolia	1 (3)	2 (2)	10 (26)	10 (23)	1 (26)	8 (28)	10 (30)	4 (31)	4 (13)	10 (2)
143	Symphoricarpos albus	- (0)	2 (3)	3 (3)	3 (2)	1 (2)	10 (21)	- (0)	3 (17)	4 (6)	4 (2)
163	Symphoricarpos oreophilus	10 (9)	6 (9)	4 (5)	6 (4)	8 (6)	1 (3)	- (0)	6 (7)	4 (5)	- (0)
145	Vaccinium caespitosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	- (0)	+ (1)	1 (3)	- (0)	- (0)	- (0)	10 (54)	2 (38)	- (0)	- (0)
148	Vaccinium scoparium	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	7 (8)	- (0)	- (0)	- (0)
	FERNS AND ALLIES										
254	Equisetum arvensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	GRAMINOIDS										
301	Agropyron spicatum	1 (15)	- (0)	1 (1)	3 (6)	- (0)	3 (5)	- (0)	1 (1)	2 (2)	- (0)
338	Bromus ciliatus	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)
304	Bromus vulgaris	- (0)	- (0)	- (0)	- (0)	+ (1)	1 (1)	- (0)	- (0)	1 (1)	- (0)
305	Calamagrostis canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
307	Calamagrostis rubescens	10 (39)	10 (52)	10 (43)	3 (3)	8 (8)	6 (32)	10 (11)	6 (18)	7 (5)	2 (15)
339	Carex disperma	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	3 (5)	4 (14)	5 (38)	3 (18)	3 (11)	1 (2)	7 (9)	4 (6)	2 (5)	- (0)
311	Carex rossii	2 (1)	2 (1)	4 (1)	1 (3)	4 (1)	3 (2)	7 (2)	2 (1)	5 (1)	2 (1)
316	Elymus glaucus	2 (1)	2 (7)	3 (2)	3 (2)	3 (5)	1 (1)	3 (3)	2 (5)	4 (1)	- (0)
317	Festuca idahoensis	1 (1)	1 (1)	- (0)	- (0)	+ (1)	3 (5)	- (0)	- (0)	- (0)	2 (1)
348	Hesperochloa kingii	- (0)	- (0)	- (0)	2 (1)	- (0)	1 (3)	- (0)	1 (2)	1 (1)	8 (2)
321	Juncus drummondii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
323	Koeleria cristata	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
325	Luzula hitchcockii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
349	Melica bulbosa	- (0)	1 (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	+ (1)	- (0)	- (0)
329	Oryzopis asperifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)
331	Poa nervosa	2 (2)	4 (1)	4 (1)	7 (2)	3 (5)	3 (5)	- (0)	+ (3)	4 (1)	2 (15)
360	Stipa occidentalis	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)

*Code to constancy values: + = 0- 5%, 1 = 5-15%, 2 = 15-25%, 3 = 25-35%, 4 = 35-45%, 5 = 45-55%, 6 = 55-65%, 7 = 65-75%, 8 = 75-85%, 9 = 85-95%, 10 = 95-100%

(con.)

APPENDIX C-1 (con.)

ADP NO.	SERIES / HABITAT TYPE / PHASE / NUMBER OF STANDS	PSEUDOTSUGA MENZIESII									
	HABITAT TYPE	CARU	CARU	SPBE	SPBE	OSCH	SYAL	VAGL	ACGL	PHMA	PHMA
	PHASE	PAMY	CARU	CARU	SPBE				PAMY	PAMY	PSME
	NUMBER OF STANDS	n=13	n=27	n=10	n= 9	n=24	n=18	n= 3	n=25	n=17	n= 5
	FORBS										
401	Achillea millefolium	2 (1)	8 (1)	3 (1)	7 (1)	5 (1)	6 (1)	- (0)	1 (2)	4 (1)	4 (0)
402	Actaea rubra	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (1)	1 (1)	- (0)
465	Aconitum columbianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
404	Allium cernuum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
414	Antennaria microphylla	2 (1)	2 (1)	1 (1)	- (0)	+ (1)	3 (1)	- (0)	- (0)	1 (1)	4 (1)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)
413	Antennaria racemosa	- (0)	1 (2)	1 (1)	2 (3)	- (0)	1 (1)	- (0)	1 (1)	- (0)	- (0)
754	Aquilegia coerulea	1 (1)	+ (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	+ (1)	- (0)	- (0)
420	Arenaria macrophylla	2 (1)	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)
421	Arnica cordifolia	9 (9)	9 (13)	9 (11)	8 (15)	5 (24)	4 (9)	7 (9)	7 (12)	6 (8)	10 (5)
422	Arnica latifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)	- (0)	- (0)
426	Aster conspicuus	- (0)	+ (37)	- (0)	2 (9)	- (0)	3 (9)	- (0)	2 (9)	1 (1)	8 (5)
582	Aster engelmannii	2 (5)	3 (3)	6 (2)	3 (2)	2 (1)	2 (1)	7 (1)	4 (6)	2 (1)	- (0)
822	Aster glaucodes	- (0)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
430	Astragalus miser	- (0)	5 (11)	2 (8)	6 (7)	1 (2)	4 (21)	- (0)	1 (9)	1 (26)	8 (5)
817	Balsamorhiza macrophylla	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
431	Balsamorhiza sagittata	1 (3)	1 (1)	3 (1)	3 (10)	1 (3)	3 (14)	- (0)	1 (8)	1 (8)	- (0)
843	Balsamorhiza incana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
769	Caltha leptosepala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
436	Campanula rotundifolia	- (0)	1 (1)	1 (1)	2 (2)	+ (1)	1 (2)	- (0)	1 (1)	2 (1)	- (0)
438	Castilleja miniata	2 (0)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
594	Castilleja rhexifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
442	Chimaphila umbellata	2 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (3)	2 (1)	- (0)	- (0)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	4 (1)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	1 (3)	1 (1)	- (0)	2 (8)	- (0)	4 (1)	- (0)	- (0)	- (0)	- (0)
847	Cymopteris hendersonii	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
455	Disporum trachycarpum	2 (0)	1 (1)	2 (2)	4 (2)	5 (1)	3 (4)	3 (15)	6 (1)	5 (2)	4 (11)
459	Epilobium angustifolium	1 (1)	3 (3)	- (0)	1 (1)	1 (1)	2 (1)	- (0)	2 (2)	2 (1)	2 (1)
465	Fragaria vesca	5 (3)	6 (3)	4 (5)	3 (1)	5 (2)	3 (7)	7 (1)	4 (5)	6 (3)	2 (1)
466	Fragaria virginiana	2 (1)	2 (3)	- (0)	3 (6)	1 (2)	4 (3)	- (0)	2 (1)	2 (2)	6 (1)
616	Frasera speciosa	- (0)	1 (1)	2 (1)	2 (1)	- (0)	2 (1)	- (0)	1 (1)	1 (2)	2 (1)
471	Galium triflorum	- (0)	+ (1)	1 (3)	- (0)	1 (2)	- (0)	- (0)	4 (1)	3 (1)	- (0)
620	Geranium richardsonii	1 (1)	2 (2)	1 (3)	1 (1)	- (0)	1 (15)	- (0)	2 (1)	1 (1)	- (0)
473	Geranium viscosissimum	2 (3)	6 (3)	3 (2)	2 (1)	3 (1)	3 (1)	- (0)	2 (1)	2 (1)	2 (1)
474	Geum triflorum	1 (3)	1 (1)	- (0)	1 (1)	+ (1)	2 (1)	- (0)	- (0)	1 (1)	- (0)
476	Goodyera oblongifolia	2 (1)	1 (1)	3 (1)	1 (1)	2 (1)	1 (1)	7 (1)	2 (2)	4 (1)	- (0)
481	Heracleum lanatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	2 (0)	1 (1)	2 (3)	- (0)	2 (1)	1 (0)	10 (2)	1 (2)	1 (2)	- (0)
486	Hieracium gracile	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
756	Ligusticum filicinum	- (0)	+ (1)	1 (1)	- (0)	+ (1)	- (0)	- (0)	+ (1)	- (0)	- (0)
639	Linum perenne	1 (1)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	1 (1)	3 (3)	- (0)	- (0)	1 (1)	2 (1)	- (0)	- (0)	- (0)	- (0)
649	Mitella pentandra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	5 (1)	1 (2)	- (0)	- (0)	5 (2)	- (0)	- (0)	4 (5)	4 (4)	- (0)
505	Osmorhiza chilensis	6 (1)	4 (1)	7 (4)	4 (2)	8 (22)	2 (1)	7 (3)	5 (5)	4 (1)	- (0)
653	Osmorhiza depauperata	- (0)	2 (1)	- (0)	1 (1)	3 (31)	2 (1)	- (0)	4 (19)	1 (3)	- (0)
507	Pedicularis bracteosa	1 (1)	1 (1)	2 (2)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
509	Pedicularis racemosa	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	3 (1)	1 (11)	1 (1)	- (0)
513	Penstemon procerus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
669	Potentilla diversifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	- (0)	1 (2)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
702	Potentilla ovina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
526	Pyrola asarifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	3 (0)	1 (1)	2 (2)	2 (2)	2 (1)	- (0)	7 (2)	4 (2)	1 (3)	2 (1)
676	Saxifraga arguta	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
681	Senecio streptanthifolius	2 (2)	2 (2)	1 (1)	2 (3)	+ (1)	2 (2)	- (0)	+ (1)	2 (1)	- (0)
539	Senecio triangularis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
541	Silene menziesii	2 (1)	3 (1)	- (0)	- (0)	5 (1)	1 (1)	- (0)	3 (1)	2 (1)	- (0)
542	Smilacina racemosa	6 (3)	3 (1)	4 (5)	3 (1)	6 (2)	6 (1)	3 (1)	7 (1)	8 (3)	4 (1)
543	Smilacina stellata	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (1)	- (0)	+ (1)	1 (1)	- (0)
684	Solidago multiradiata	- (0)	1 (1)	1 (1)	3 (1)	- (0)	2 (5)	- (0)	- (0)	1 (2)	2 (1)
546	Streptopus amplexifolius	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)
714	Thalictrum fendleri	2 (1)	2 (4)	1 (15)	2 (8)	5 (4)	3 (11)	- (0)	5 (6)	4 (7)	- (0)
547	Thalictrum occidentale	5 (3)	2 (2)	5 (12)	2 (20)	2 (14)	2 (10)	7 (8)	1 (26)	1 (2)	2 (1)
690	Trollius laxus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
550	Valeriana dioica & occidentalis	- (0)	3 (3)	2 (1)	1 (3)	3 (2)	1 (1)	- (0)	1 (1)	- (0)	4 (3)
554	Viola adunca	5 (1)	2 (1)	- (0)	2 (1)	3 (1)	1 (1)	- (0)	4 (1)	5 (1)	2 (1)
555	Viola canadensis	- (0)	+ (3)	3 (1)	1 (1)	+ (3)	1 (1)	- (0)	2 (1)	1 (3)	- (0)
693	Viola nuttallii	1 (1)	2 (1)	- (0)	1 (1)	2 (1)	- (0)	- (0)	+ (1)	- (0)	- (0)
557	Viola orbiculata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

(con.)

APPENDIX C-1

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases

ADP NO.	SERIES	PICEA ENGELMANNII									
	HABITAT TYPE PHASE NUMBER OF STANDS	EQAR n=10	CALE n=10	CADI n= 4	GATR n= 8	LIBO n= 8	VASC n=13	JUCO n=21	RIMO n= 5	ARCO n=17	HYRE n=11
	TREES										
002	Abies lasiocarpa	7 (16)	7 (16)	3 (3)	6 (4)	- (0)	2 (2)	2 (2)	2 (1)	1 (15)	3 (2)
007	Picea engelmannii	8 (59)	9 (51)	3 (85)	6 (66)	9 (40)	10 (30)	10 (32)	10 (48)	9 (33)	9 (55)
008	Picea glauca	1 (37)	1 (63)	5 (74)	3 (50)	1 (85)	- (0)	- (0)	- (0)	1 (37)	1 (63)
022	Picea pungens	1 (37)	- (0)	3 (37)	1 (98)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	- (0)	2 (8)	- (0)	- (0)	1 (1)	4 (29)	1 (26)	4 (31)	3 (23)	4 (10)
010	Pinus contorta	3 (13)	2 (19)	- (0)	4 (10)	5 (27)	7 (33)	4 (13)	2 (63)	6 (15)	3 (1)
011	Pinus flexilis	- (0)	1 (15)	- (0)	- (0)	- (0)	3 (13)	8 (12)	2 (3)	4 (6)	2 (9)
014	Populus tremuloides	1 (3)	- (0)	3 (1)	- (0)	- (0)	- (0)	1 (5)	- (0)	1 (98)	- (0)
016	Pseudotsuga menziesii	- (0)	- (0)	- (0)	1 (15)	5 (38)	- (0)	7 (24)	- (0)	6 (22)	5 (27)
	SHRUBS AND SUBSHRUBS										
102	Acer glabrum	- (0)	- (0)	- (0)	3 (1)	1 (1)	- (0)	1 (3)	- (0)	1 (1)	1 (1)
167	Acer grandidentatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
104	Alnus sinuata	- (0)	- (0)	3 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	2 (1)	- (0)	- (0)	4 (1)	3 (2)	- (0)	+ (1)	- (0)	- (0)	- (0)
201	Arctostaphylos uva-ursi	1 (1)	- (0)	- (0)	- (0)	6 (1)	- (0)	3 (1)	- (0)	- (0)	1 (1)
150	Artemisia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
203	Berberis repens	1 (1)	- (0)	3 (0)	1 (1)	4 (11)	- (0)	1 (1)	- (0)	- (0)	- (0)
107	Ceanothus velutinus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
173	Cercocarpus ledifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
204	Clematis columbiana	- (0)	- (0)	- (0)	5 (1)	5 (1)	- (0)	+ (1)	- (0)	1 (1)	- (0)
112	Juniperus communis	1 (15)	1 (1)	- (0)	5 (1)	10 (4)	3 (1)	10 (16)	4 (1)	6 (1)	3 (1)
153	Juniperus horizontalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
113	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	4 (20)	- (0)	5 (26)	4 (7)	10 (25)	- (0)	- (0)	- (0)	- (0)	- (0)
115	Lonicera utahensis	3 (1)	2 (2)	- (0)	5 (1)	4 (6)	- (0)	- (0)	- (0)	- (0)	- (0)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	- (0)	- (0)	- (0)	3 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
122	Physocarpus malvaceus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
125	Purshia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
128	Ribes cereum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (0)	- (0)	- (0)	2 (1)
158	Ribes hudsonianum	1 (1)	- (0)	5 (8)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	8 (4)	5 (3)	8 (5)	8 (16)	4 (2)	- (0)	1 (1)	- (0)	- (0)	1 (15)
159	Ribes montigenum	- (0)	1 (1)	- (0)	- (0)	4 (0)	2 (0)	2 (2)	10 (10)	4 (1)	4 (0)
131	Ribes viscosissimum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	1 (1)
132	Rosa acicularis	1 (3)	- (0)	- (0)	3 (15)	4 (11)	- (0)	- (0)	- (0)	- (0)	- (0)
161	Rosa nutkana	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
134	Rosa woodsii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	5 (1)	2 (1)	2 (2)	- (0)
136	Rubus parviflorus	- (0)	- (0)	3 (1)	1 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
137	Salix scouleriana	2 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (3)
139	Shepherdia canadensis	4 (1)	- (0)	- (0)	3 (1)	6 (4)	- (0)	7 (9)	4 (1)	3 (0)	4 (1)
140	Sorbus scopulina	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
142	Spiraea betulifolia	- (0)	- (0)	- (0)	- (0)	4 (7)	- (0)	- (0)	- (0)	- (0)	- (0)
143	Symphoricarpos albus	2 (1)	- (0)	3 (1)	3 (3)	8 (15)	- (0)	- (0)	- (0)	1 (1)	- (0)
163	Symphoricarpos oreophilus	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	4 (5)	- (0)	1 (1)	2 (1)
145	Vaccinium caespitosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	1 (1)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
148	Vaccinium scoparium	3 (1)	9 (37)	- (0)	3 (8)	1 (15)	10 (46)	- (0)	2 (1)	1 (0)	- (0)
	FERNS AND ALLIES										
254	Equisetum arvensis	10 (73)	5 (1)	10 (4)	4 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	GRAMINOIDS										
301	Agropyron spicatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	1 (1)	- (0)
338	Bromus ciliatus	4 (2)	2 (8)	- (0)	- (0)	- (0)	- (0)	1 (1)	2 (1)	1 (0)	- (0)
304	Bromus vulgaris	2 (2)	- (0)	- (0)	3 (1)	1 (1)	- (0)	+ (1)	- (0)	- (0)	- (0)
305	Calamagrostis canadensis	5 (5)	3 (13)	3 (1)	3 (33)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
307	Calamagrostis rubescens	1 (1)	- (0)	- (0)	4 (5)	6 (10)	- (0)	1 (0)	- (0)	- (0)	- (0)
339	Carex disperma	7 (6)	- (0)	10 (27)	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	1 (1)	- (0)	- (0)	- (0)	1 (15)	- (0)	+ (1)	- (0)	- (0)	- (0)
311	Carex rossii	- (0)	2 (1)	- (0)	- (0)	1 (3)	5 (4)	5 (1)	2 (1)	6 (1)	5 (0)
316	Elymus glaucus	3 (1)	- (0)	- (0)	3 (3)	1 (1)	- (0)	- (0)	- (0)	1 (1)	- (0)
317	Festuca idahoensis	- (0)	- (0)	- (0)	- (0)	- (0)	2 (0)	3 (1)	- (0)	5 (3)	2 (0)
348	Hesperochloa kingii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	4 (1)	- (0)	4 (1)	1 (1)
321	Juncus drummondii	- (0)	6 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
323	Koeleria cristata	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	2 (1)	- (0)	- (0)
325	Luzula hitchcockii	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	5 (1)	6 (4)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
349	Melica bulbosa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
329	Oryzopsis asperifolia	1 (1)	- (0)	3 (1)	1 (3)	3 (9)	- (0)	- (0)	- (0)	- (0)	- (0)
331	Poa nervosa	- (0)	1 (0)	- (0)	- (0)	5 (1)	5 (4)	4 (1)	4 (8)	4 (1)	5 (1)
360	Stipa occidentalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
334	Trisetum spicatum	- (0)	3 (1)	- (0)	- (0)	- (0)	2 (1)	2 (1)	- (0)	5 (1)	3 (1)

*Code to constancy values: + = 0- 5% 2 = 15-25% 4 = 35-45% 6 = 55-65% 8 = 75-85% 10 = 95-100%
1 = 5-15% 3 = 25-35% 5 = 45-55% 7 = 65-75% 9 = 85-95%

(con.)

APPENDIX C-1 (con.)

ADP NO.	SERIES / HABITAT TYPE / PHASE / NUMBER OF STANDS	PICEA ENGELMANNII EQAR n=10	CALE n=10	CADI n= 4	GATR n= 8	LIBO n= 8	VASC n=13	JUCO n=21	RIMO n= 5	ARCO n=17	HYRE n=11
	FORBS										
401	Achillea millefolium	1 (1)	2 (1)	3 (1)	1 (1)	3 (0)	2 (1)	3 (1)	8 (1)	6 (0)	- (0)
402	Actaea rubra	4 (5)	- (0)	8 (5)	9 (4)	4 (T)	- (0)	- (0)	- (0)	1 (T)	1 (T)
565	Aconitum columbianum	3 (7)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
404	Allium cernuum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	4 (1)	3 (1)	- (0)
414	Antennaria microphylla	1 (1)	- (0)	3 (1)	1 (1)	- (0)	5 (1)	3 (1)	2 (1)	4 (1)	4 (0)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
413	Antennaria racemosa	- (0)	- (0)	- (0)	- (0)	5 (5)	- (0)	1 (1)	2 (1)	2 (5)	1 (1)
754	Aquilegia coerulea	1 (3)	3 (2)	- (0)	3 (1)	- (0)	3 (1)	4 (1)	8 (1)	6 (2)	2 (0)
420	Arenaria macrophylla	- (0)	- (0)	3 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)
421	Arnica cordifolia	4 (2)	5 (5)	3 (1)	4 (5)	9 (10)	8 (3)	8 (4)	10 (4)	10 (12)	6 (1)
422	Arnica latifolia	- (0)	6 (4)	- (0)	- (0)	- (0)	2 (1)	+ (1)	- (0)	- (0)	- (0)
426	Aster conspicuus	2 (1)	- (0)	3 (1)	3 (8)	6 (2)	- (0)	+ (1)	2 (1)	1 (2)	2 (2)
582	Aster engelmannii	1 (3)	- (0)	- (0)	1 (1)	1 (1)	- (0)	+ (1)	- (0)	1 (15)	- (0)
822	Aster glaucodes	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
430	Astragalus miser	1 (1)	1 (0)	- (0)	1 (1)	5 (5)	2 (3)	6 (10)	2 (15)	8 (6)	4 (0)
843	Balsamorhiza incana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	1 (1)	- (0)
817	Balsamorhiza macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
431	Balsamorhiza sagittata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
769	Caltha leptosepala	- (0)	7 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
436	Campanula rotundifolia	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	2 (0)	- (0)	2 (0)	3 (0)
438	Castilleja miniata	1 (1)	- (0)	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
594	Castilleja rhexifolia	- (0)	6 (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
442	Chimaphila umbellata	1 (1)	- (0)	- (0)	- (0)	3 (8)	- (0)	- (0)	- (0)	- (0)	- (0)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
847	Cymopteris hendersonii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (3)	- (0)
455	Disporum trachycarpum	2 (0)	- (0)	3 (1)	5 (1)	5 (2)	- (0)	- (0)	- (0)	1 (1)	1 (1)
459	Epilobium angustifolium	7 (3)	8 (1)	5 (1)	6 (1)	8 (1)	5 (1)	5 (1)	6 (1)	4 (1)	2 (1)
465	Fragaria vesca	4 (1)	- (0)	3 (1)	5 (1)	8 (7)	1 (1)	+ (1)	2 (3)	1 (15)	1 (1)
466	Fragaria virginiana	5 (1)	2 (1)	3 (1)	4 (13)	5 (5)	- (0)	3 (1)	4 (1)	5 (1)	1 (1)
616	Frasera speciosa	1 (1)	- (0)	- (0)	- (0)	3 (1)	- (0)	5 (2)	4 (1)	5 (1)	2 (0)
471	Galium triflorum	6 (15)	- (0)	10 (5)	5 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
620	Geranium richardsonii	6 (4)	3 (2)	10 (1)	5 (5)	4 (2)	1 (15)	- (0)	- (0)	1 (1)	- (0)
473	Geranium viscossissimum	2 (8)	- (0)	3 (1)	- (0)	1 (1)	1 (1)	+ (1)	- (0)	1 (1)	- (0)
474	Geum triflorum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	2 (1)	4 (0)	- (0)
476	Goodyera oblongifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
481	Heracleum lanatum	2 (3)	2 (2)	3 (1)	4 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
486	Hieracium gracile	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
756	Ligusticum filicinum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
639	Linum perenne	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	- (0)	- (0)	3 (1)	- (0)	- (0)	- (0)	+ (1)	- (0)	1 (1)	- (0)
649	Mitella pentandra	6 (6)	6 (2)	5 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	1 (15)	1 (1)	- (0)	3 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
505	Osmorhiza chilensis	4 (2)	- (0)	3 (1)	- (0)	8 (1)	1 (3)	- (0)	- (0)	- (0)	- (0)
653	Osmorhiza depauperata	4 (1)	3 (1)	3 (1)	6 (1)	- (0)	1 (1)	1 (1)	2 (1)	2 (1)	- (0)
507	Pedicularis bracteosa	1 (1)	7 (1)	- (0)	- (0)	- (0)	3 (0)	- (0)	2 (1)	- (0)	- (0)
509	Pedicularis racemosa	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
513	Penstemon procerus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
669	Potentilla diversifolia	- (0)	6 (1)	- (0)	- (0)	- (0)	5 (1)	+ (1)	4 (2)	2 (1)	4 (1)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	2 (2)	2 (1)	- (0)	1 (1)	1 (1)	- (0)	+ (1)	- (0)	2 (1)	- (0)
702	Potentilla ovina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	2 (1)	1 (1)	- (0)
526	Pyrola asarifolia	3 (2)	- (0)	8 (1)	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	8 (2)	9 (4)	8 (1)	9 (1)	9 (4)	2 (3)	7 (1)	- (0)	4 (1)	7 (1)
676	Saxifraga arguta	7 (16)	7 (4)	5 (19)	1 (37)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	3 (1)	3 (1)	1 (1)	- (0)	2 (2)	- (0)	2 (1)	1 (1)	2 (1)
681	Senecio streptanthifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	4 (2)	6 (1)	4 (0)
539	Senecio triangularis	7 (12)	6 (16)	3 (37)	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
541	Silene menziesii	- (0)	- (0)	- (0)	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
542	Smilacina racemosa	1 (3)	- (0)	3 (1)	1 (1)	4 (1)	- (0)	- (0)	- (0)	1 (1)	1 (0)
543	Smilacina stellata	5 (7)	- (0)	5 (1)	8 (11)	4 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
684	Solidago multiradiata	- (0)	- (0)	- (0)	- (0)	1 (1)	4 (2)	5 (3)	8 (1)	5 (1)	4 (1)
546	Streptopus amplexifolius	4 (8)	3 (22)	- (0)	3 (20)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
714	Thalictrum fendleri	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
547	Thalictrum occidentale	2 (2)	1 (15)	3 (1)	4 (5)	5 (8)	- (0)	+ (1)	- (0)	3 (3)	- (0)
690	Trollius laxus	2 (2)	9 (17)	- (0)	- (0)	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)
550	Valeriana dioica & occidentalis	1 (1)	1 (15)	3 (1)	- (0)	3 (1)	- (0)	- (0)	- (0)	1 (1)	1 (1)
554	Viola adunca	1 (1)	- (0)	- (0)	3 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
555	Viola canadensis	1 (3)	1 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
693	Viola nuttallii	1 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
557	Viola orbiculata	2 (1)	- (0)	8 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

(con.)

APPENDIX C-1

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases.

ADP NO.	SERIES	ABIES LASIOCARPA													
	HABITAT TYPE	CACA	ACRU	PHMA	ACGL	LIBO	LIBO	VAGL	VAGL	VAGL	VASC	VASC	VASC	ARLA	SYAL
	PHASE	CACA				LIBO	VASC	VAGL	PAMY	VASC	CARU	VASC	PIAL		
	NUMBER OF STANDS	n= 4	n=18	n= 8	n=23	n=15	n=11	n= 4	n=51	n=10	n= 5	n=61	n=27	n=21	n=11
	TREES														
002	Abies lasiocarpa	10 (34)	10 (29)	10 (25)	10 (25)	10 (15)	9 (14)	10 (21)	10 (27)	10 (30)	10 (19)	10 (25)	10 (19)	10 (28)	10 (23)
007	Picea engelmannii	10 (41)	9 (30)	6 (7)	6 (16)	9 (43)	9 (37)	8 (10)	8 (26)	10 (32)	2 (1)	9 (29)	9 (18)	10 (34)	6 (15)
008	Picea glauca	- (0)	- (0)	- (0)	- (0)	1 (74)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (37)
022	Picea pungens	- (0)	2 (5)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	5 (1)	1 (3)	- (0)	+ (15)	1 (8)	4 (1)	5 (3)	1 (7)	5 (5)	2 (1)	2 (2)	10 (35)	2 (34)	- (0)
010	Pinus contorta	5 (15)	5 (8)	1 (3)	4 (18)	8 (22)	9 (32)	8 (31)	7 (31)	9 (18)	10 (38)	7 (35)	7 (26)	2 (17)	7 (21)
011	Pinus flexilis	3 (1)	- (0)	1 (15)	1 (1)	1 (1)	1 (15)	- (0)	1 (5)	1 (1)	- (0)	2 (7)	2 (38)	1 (9)	3 (0)
014	Populus tremuloides	- (0)	1 (3)	1 (37)	+ (3)	1 (63)	- (0)	- (0)	+ (15)	- (0)	2 (1)	- (0)	- (0)	1 (26)	3 (26)
016	Pseudotsuga menziesii	- (0)	5 (17)	10 (53)	9 (36)	5 (24)	4 (13)	8 (30)	6 (13)	1 (0)	4 (1)	1 (19)	+ (15)	3 (17)	8 (23)
	SHRUBS AND SUBSHRUBS														
102	Acer glabrum	- (0)	3 (8)	10 (8)	8 (23)	1 (1)	- (0)	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (2)
167	Acer grandidentatum	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
104	Alnus sinuata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	3 (3)	3 (1)	9 (7)	9 (6)	1 (1)	- (0)	3 (1)	5 (6)	2 (8)	4 (1)	1 (1)	- (0)	- (0)	10 (9)
201	Arctostaphylos uva-ursi	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (3)	- (0)	- (0)	- (0)	2 (1)	+ (1)	- (0)	- (0)	2 (2)
150	Artemisia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)
203	Berberis repens	- (0)	4 (1)	6 (4)	7 (1)	5 (2)	2 (9)	3 (3)	1 (1)	2 (1)	2 (1)	1 (1)	+ (1)	- (0)	6 (4)
107	Ceanothus velutinus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
173	Cercocarpus ledifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
204	Clematis columbiana	- (0)	2 (5)	9 (4)	2 (3)	3 (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (13)
112	Juniperus communis	- (0)	2 (1)	4 (1)	- (0)	7 (5)	5 (7)	- (0)	+ (1)	1 (1)	2 (1)	2 (6)	1 (6)	+ (1)	5 (4)
113	Juniperus horizontalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
153	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	- (0)	1 (15)	- (0)	- (0)	10 (35)	10 (21)	- (0)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
115	Lonicera utahensis	3 (15)	9 (5)	8 (6)	7 (13)	3 (4)	6 (4)	10 (9)	6 (10)	7 (10)	6 (2)	3 (2)	1 (1)	2 (1)	6 (2)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	3 (37)	7 (2)	10 (9)	10 (13)	1 (2)	1 (3)	- (0)	9 (3)	6 (4)	8 (1)	3 (6)	+ (15)	5 (3)	9 (4)
122	Physocarpus malvaceus	- (0)	1 (3)	10 (59)	2 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (3)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	- (0)	1 (3)	1 (1)	2 (5)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	5 (1)
125	Purshia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
128	Ribes cereum	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	+ (1)	- (0)
158	Ribes hudsonianum	- (0)	1 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	3 (3)	7 (5)	3 (2)	2 (1)	3 (3)	3 (3)	- (0)	2 (2)	1 (1)	- (0)	1 (2)	+ (3)	- (0)	2 (1)
159	Ribes montigenum	- (0)	1 (2)	- (0)	1 (1)	1 (3)	1 (1)	3 (3)	1 (2)	1 (1)	- (0)	2 (2)	1 (2)	7 (4)	- (0)
131	Ribes viscosissimum	- (0)	3 (2)	- (0)	5 (2)	- (0)	2 (2)	5 (2)	3 (1)	- (0)	- (0)	1 (0)	- (0)	1 (1)	- (0)
132	Rosa acicularis	- (0)	1 (3)	- (0)	- (0)	5 (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
161	Rosa nutkana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
134	Rosa woodsii	- (0)	1 (3)	1 (1)	3 (2)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	+ (1)	- (0)	1 (1)	1 (1)
136	Rubus parviflorus	- (0)	6 (7)	1 (3)	6 (5)	- (0)	- (0)	5 (3)	3 (2)	1 (1)	2 (1)	1 (1)	- (0)	1 (2)	- (0)
137	Salix scouleriana	- (0)	1 (15)	3 (1)	3 (6)	- (0)	- (0)	- (0)	+ (1)	1 (3)	- (0)	+ (1)	- (0)	1 (3)	1 (1)
139	Shepherdia canadensis	3 (3)	2 (1)	4 (1)	3 (7)	8 (4)	4 (15)	3 (1)	4 (7)	3 (5)	2 (3)	2 (9)	1 (1)	1 (1)	5 (4)
140	Sorbus scopulina	3 (3)	4 (9)	5 (6)	8 (13)	1 (1)	- (0)	8 (1)	7 (2)	4 (1)	4 (1)	2 (1)	- (0)	2 (1)	3 (1)
142	Spiraea betulifolia	3 (37)	3 (7)*	8 (17)	3 (13)	3 (8)	2 (15)	10 (5)	4 (10)	1 (1)	2 (15)	+ (2)	- (0)	- (0)	3 (22)
143	Symphoricarpos albus	- (0)	2 (10)	5 (9)	- (0)	3 (10)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	10 (15)
163	Symphoricarpos oreophilus	3 (3)	2 (1)	- (0)	4 (2)	1 (3)	1 (3)	3 (3)	1 (1)	- (0)	- (0)	+ (1)	- (0)	3 (1)	- (0)
145	Vaccinium caespitosum	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	5 (9)	4 (16)	- (0)	5 (31)	1 (2)	3 (7)	10 (16)	10 (49)	10 (32)	- (0)	2 (2)	2 (1)	1 (3)	1 (1)
148	Vaccinium scoparium	10 (33)	1 (15)	- (0)	2 (20)	2 (1)	10 (36)	5 (1)	3 (9)	10 (52)	10 (51)	10 (53)	10 (57)	2 (3)	1 (1)
	FERNS AND ALLIES														
254	Equisetum arvensis	3 (3)	1 (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
	GRAMINOIDS														
301	Agropyron spicatum	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
338	Bromus ciliatus	3 (3)	4 (2)	1 (3)	2 (9)	3 (2)	2 (3)	- (0)	1 (4)	1 (1)	- (0)	1 (1)	- (0)	1 (2)	- (0)
304	Bromus vulgaris	- (0)	2 (5)	1 (1)	2 (11)	- (0)	1 (3)	5 (8)	1 (7)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (8)
305	Calamagrostis canadensis	10 (37)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	+ (1)	1 (0)	- (0)	1 (1)
307	Calamagrostis rubescens	- (0)	2 (4)	5 (5)	5 (11)	5 (26)	5 (6)	8 (11)	4 (25)	2 (37)	10 (38)	1 (2)	+ (0)	+ (1)	8 (28)
339	Carex disperma	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	3 (15)	3 (7)	- (0)	3 (9)	1 (2)	1 (1)	8 (11)	3 (8)	4 (2)	6 (6)	2 (11)	1 (11)	3 (7)	3 (14)
311	Carex rossii	- (0)	3 (1)	3 (1)	3 (1)	2 (1)	1 (1)	8 (1)	5 (2)	3 (1)	4 (2)	5 (1)	6 (2)	5 (1)	2 (1)
316	Elymus glaucus	5 (3)	3 (1)	3 (0)	4 (5)	3 (2)	4 (1)	5 (2)	3 (1)	5 (1)	2 (1)	1 (2)	3 (1)	- (0)	3 (5)
317	Festuca idahoensis	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)
348	Hesperochloa kingii	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
321	Juncus drummondii	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)
323	Koeleria cristata	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
325	Luzula hitchcockii	- (0)	- (0)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	3 (3)	1 (1)	- (0)	+ (3)	- (0)	- (0)	- (0)	+ (1)	1 (1)	- (0)	+ (1)	- (0)	- (0)	- (0)
349	Melica bulbosa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
329	Oryzopsis asperifolia	- (0)	1 (3)	- (0)	- (0)	1 (8)	1 (15)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
331	Poa nervosa	- (0)	1 (3)	3 (1)	+ (1)	1 (15)	1 (1)	5 (2)	1 (1)	- (0)	2 (1)	3 (3)	3 (1)	4 (1)	2 (1)
360	Stipa occidentalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)

*Code to constancy values: + = 0- 5% 2 = 15-25% 4 = 35-45% 6 = 55-65% 8 = 75-85% 10 = 95-100%
1 = 5-15% 3 = 25-35% 5 = 45-55% 7 = 65-75% 9 = 85-95%

(con.)

APPENDIX C-1

APPENDIX C-1 (con.)

ADP NO.	SERIES	ABIES LASIOCARPA													
	HABITAT TYPE	CACA	ACRU	PHMA	ACGL	LIBO	LIBO	VAGL	VAGL	VAGL	VASC	VASC	VASC	ARLA	SYAL
	PHASE	CACA				LIBO	VASC	VAGL	PAMY	VASC	CARU	VASC	PIAL		
	NUMBER OF STANDS	n= 4	n=18	n= 8	n=23	n=15	n=11	n= 4	n=51	n=10	n= 5	n=61	n=27	n=21	n=11
	FORBS														
401	Achillea millefolium	- (0)	- (0)	- (0)	2 (2)	3 (1)	- (0)	- (0)	1 (1)	- (0)	4 (1)	1 (1)	2 (1)	7 (1)	4 (1)
402	Actaea rubra	- (0)	10 (11)	1 (0)	2 (T)	4 (T)	- (0)	- (0)	1 (T)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (T)
565	Aconitum columbianum	3 (3)	1 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
404	Allium cernuum	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
414	Antennaria microphylla	- (0)	- (0)	- (0)	- (0)	1 (8)	2 (0)	- (0)	1 (1)	- (0)	4 (1)	1 (1)	1 (5)	+ (3)	2 (1)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
413	Antennaria racemosa	- (0)	1 (2)	- (0)	+ (1)	5 (3)	6 (3)	3 (0)	1 (7)	5 (1)	2 (1)	2 (3)	3 (3)	+ (1)	1 (1)
754	Aquilegia coerulea	3 (3)	4 (3)	1 (1)	3 (0)	3 (1)	3 (2)	- (0)	3 (1)	1 (1)	2 (1)	3 (1)	3 (3)	5 (1)	1 (1)
420	Arenaria macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
421	Arnica cordifolia	8 (10)	8 (7)	8 (4)	9 (5)	10 (8)	10 (11)	10 (15)	9 (8)	10 (3)	8 (6)	9 (7)	6 (11)	7 (4)	7 (11)
422	Arnica latifolia	- (0)	2 (6)	- (0)	+ (15)	- (0)	- (0)	- (0)	4 (18)	3 (1)	2 (1)	2 (7)	4 (7)	10 (18)	- (0)
426	Aster conspicuus	- (0)	2 (9)	5 (5)	1 (9)	7 (12)	5 (4)	8 (13)	1 (8)	2 (8)	- (0)	1 (1)	+ (3)	1 (8)	3 (33)
582	Aster engelmannii	3 (15)	6 (4)	4 (1)	7 (2)	2 (1)	1 (1)	8 (2)	6 (4)	2 (2)	4 (1)	2 (1)	3 (3)	6 (4)	2 (1)
822	Aster glaucodes	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
430	Astragalus miser	- (0)	1 (1)	- (0)	- (0)	3 (2)	3 (1)	3 (1)	+ (1)	- (0)	4 (1)	1 (3)	2 (6)	1 (1)	2 (2)
817	Balsamorhiza macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
431	Balsamorhiza sagittata	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (2)
843	Balsamorhiza incana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
769	Caltha leptosepala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)
436	Campanula rotundifolia	- (0)	- (0)	1 (1)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	2 (1)
438	Castilleja miniata	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	1 (1)	1 (1)	- (0)	+ (1)	+ (1)	- (0)	1 (0)
594	Castilleja rhexifolia	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)	1 (1)	- (0)
442	Chimaphila umbellata	- (0)	2 (0)	- (0)	4 (3)	1 (1)	- (0)	3 (3)	4 (2)	3 (1)	2 (3)	+ (1)	- (0)	- (0)	2 (1)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (C)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)
847	Cymopteris hendersonii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
455	Disporum trachycarpum	- (0)	3 (3)	9 (3)	4 (1)	3 (1)	1 (1)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (1)
459	Epilobium angustifolium	8 (1)	4 (1)	5 (1)	3 (1)	8 (1)	6 (5)	5 (1)	3 (1)	5 (1)	6 (1)	6 (1)	6 (2)	3 (2)	9 (1)
465	Fragaria vesca	- (0)	6 (1)	9 (2)	5 (2)	6 (1)	2 (3)	5 (1)	2 (1)	3 (1)	2 (1)	2 (1)	1 (1)	1 (2)	3 (1)
466	Fragaria virginiana	8 (6)	3 (1)	- (0)	2 (5)	3 (4)	3 (1)	3 (3)	1 (1)	1 (1)	6 (1)	1 (1)	1 (1)	1 (2)	5 (1)
616	Frasera speciosa	- (0)	1 (1)	1 (1)	+ (1)	6 (1)	4 (1)	- (0)	1 (1)	- (0)	4 (1)	1 (2)	1 (1)	2 (1)	3 (1)
471	Galium triflorum	3 (1)	7 (4)	3 (3)	5 (3)	1 (1)	1 (3)	3 (1)	1 (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	4 (1)
620	Geranium richardsonii	5 (2)	5 (3)	- (0)	2 (1)	3 (4)	4 (2)	5 (3)	1 (2)	- (0)	- (0)	1 (3)	1 (2)	- (0)	- (0)
473	Geranium viscosissimum	- (0)	1 (1)	- (0)	2 (8)	2 (1)	- (0)	3 (1)	1 (1)	- (0)	8 (5)	1 (1)	1 (1)	1 (1)	6 (3)
474	Geum triflorum	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)
476	Goodyera oblongifolia	- (0)	4 (1)	3 (1)	5 (1)	- (0)	- (0)	3 (3)	3 (1)	2 (1)	- (0)	1 (1)	+ (1)	+ (1)	1 (1)
481	Heracleum lanatum	- (0)	2 (1)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	- (0)	3 (1)	1 (1)	4 (2)	- (0)	1 (3)	5 (1)	5 (1)	2 (1)	6 (1)	2 (1)	- (0)	2 (1)	4 (1)
486	Hieracium gracile	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	2 (2)	+ (1)	- (0)
756	Ligusticum filicinum	3 (3)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	- (0)	2 (1)	1 (1)	- (0)	4 (1)	3 (1)
639	Linum perenne	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	- (0)	- (0)	- (0)	+ (1)	1 (1)	1 (3)	- (0)	1 (1)	- (0)	6 (1)	1 (6)	1 (13)	1 (1)	3 (1)
649	Mitella pentandra	3 (15)	1 (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	3 (3)	6 (1)	6 (1)	7 (1)	- (0)	1 (1)	- (0)	2 (1)	1 (1)	- (0)	1 (1)	- (0)	1 (1)	- (0)
505	Osmorhiza chilensis	3 (3)	7 (4)	4 (6)	5 (9)	3 (2)	5 (2)	8 (7)	4 (3)	2 (2)	- (0)	2 (1)	1 (0)	5 (1)	3 (1)
653	Osmorhiza depauperata	3 (3)	4 (1)	1 (1)	5 (9)	4 (1)	1 (1)	3 (3)	5 (3)	4 (1)	4 (1)	3 (1)	2 (1)	3 (2)	5 (1)
507	Pedicularis bracteosa	- (0)	1 (1)	1 (1)	1 (1)	1 (3)	1 (1)	5 (3)	1 (1)	3 (0)	4 (1)	2 (1)	4 (4)	+ (1)	2 (2)
509	Pedicularis racemosa	3 (3)	4 (2)	3 (1)	5 (9)	- (0)	1 (1)	5 (8)	6 (4)	5 (2)	4 (1)	5 (5)	3 (1)	8 (4)	2 (1)
513	Penstemon procerus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
669	Potentilla diversifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (3)	- (0)	- (0)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	3 (3)	1 (3)	- (0)	- (0)	1 (2)	- (0)	- (0)	+ (1)	- (0)	- (0)	+ (0)	+ (1)	1 (1)	2 (1)
702	Potentilla ovina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
526	Pyrola asarifolia	5 (1)	2 (2)	- (0)	1 (1)	1 (3)	2 (2)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	10 (2)	8 (3)	8 (1)	9 (3)	8 (1)	9 (2)	8 (3)	7 (3)	7 (2)	4 (1)	6 (2)	4 (1)	6 (3)	5 (1)
676	Saxifraga arguta	3 (15)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
681	Senecio streptanthifolius	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)
539	Senecio triangularis	3 (3)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	+ (0)	+ (1)	- (0)	- (0)
541	Silene menziesii	- (0)	- (0)	- (0)	3 (1)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	- (0)	1 (2)	1 (0)
542	Smilacina racemosa	- (0)	2 (1)	6 (1)	3 (1)	2 (1)	- (0)	3 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	4 (1)
543	Smilacina stellata	3 (3)	3 (4)	1 (1)	+ (1)	2 (1)	- (0)	- (0)	+ (1)	- (0)	- (0)	+ (1)	+ (0)	- (0)	- (0)
684	Solidago multiradiata	- (0)	1 (1)	- (0)	- (0)	3 (1)	2 (2)	3 (1)	+ (1)	- (0)	- (0)	3 (1)	1 (0)	1 (1)	- (0)
546	Streptopus amplexifolius	5 (1)	1 (3)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (0)	- (0)	+ (0)	1 (1)
714	Thalictrum fendleri	3 (37)	4 (5)	4 (5)	5 (5)	1 (1)	- (0)	3 (1)	4 (4)	2 (1)	2 (15)	1 (3)	1 (19)	1 (2)	3 (1)
547	Thalictrum occidentale	- (0)	4 (7)	4 (1)	1 (11)	4 (2)	3 (2)	5 (15)	1 (3)	2 (3)	- (0)	1 (2)	- (0)	- (0)	2 (2)
690	Trollius laxus	3 (3)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	+ (1)	- (0)	- (0)	- (0)
550	Valeriana dioica & occidentalis	- (0)	1 (3)	- (0)	- (0)	2 (1)	1 (3)	- (0)	+ (3)	- (0)	- (0)	+ (1)	+ (1)	+ (1)	1 (1)
554	Viola adunca	- (0)	2 (2)	4 (1)	4 (1)	1 (2)	- (0)	3 (3)	2 (3)	- (0)	8 (1)	+ (0)	- (0)	- (0)	5 (1)
555	Viola canadensis	- (0)	- (0)	1 (0)	1 (1)	- (0)	- (0)	5 (2)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	1 (1)
693	Viola nuttallii	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	+ (1)	- (0)	2 (1)	+ (1)	- (0)	1 (1)	- (0)
557	Viola orbiculata	- (0)	1 (1)	1 (1)	+ (3)	- (0)	- (0)	- (0)	+ (2)	2 (1)	- (0)	+ (1)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

(con.)

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases.

ADP NO.	SERIES	ABIES LASIOCARPA															
	HABITAT TYPE	THOC	OSCH	OSCH	SPBE	CARU	CARU	BERE	JUCO	RIMO	RIMO	PERA	ARCO	ARCO	ARCO	ARCO	CARO
	PHASE		OSCH	PAMY		CARU	PAMY	BERE		RIMO	PIAL		PIEN	SHCA	ARCO	ASMI	
	NUMBER OF STANDS	n=16	n=23	n= 9	n=11	n=16	n- 6	n=48	n= 8	n=10	n= 8	n=18	n=12	n=10	n=17	n=11	n= 4
	TREES																
002	Abies lasiocarpa	10 (31)	10 (30)	10 (31)	10 (27)	10 (25)	10 (20)	10 (26)	10 (20)	10 (50)	10 (44)	10 (53)	10 (24)	10 (19)	10 (35)	9 (21)	10 (44)
007	Picea engelmannii	7 (22)	2 (16)	4 (15)	5 (11)	3 (4)	3 (3)	4 (20)	5 (23)	5 (43)	4 (17)	7 (17)	10 (55)	3 (7)	5 (7)	5 (3)	3 (1)
008	Picea glauca	- (0)	- (0)	- (0)	1 (37)	- (0)	- (0)	- (0)	1 (37)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
022	Picea pungens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	3 (2)	- (0)	2 (20)	- (0)	+ (3)	- (0)	+ (15)	1 (63)	2 (0)	10 (63)	2 (6)	2 (26)	3 (14)	2 (1)	- (0)	- (0)
010	Pinus contorta	6 (12)	4 (36)	3 (34)	7 (22)	9 (35)	5 (26)	6 (31)	9 (23)	4 (8)	- (0)	9 (25)	8 (16)	10 (42)	8 (35)	10 (38)	10 (26)
011	Pinus flexilis	2 (1)	- (0)	1 (15)	- (0)	1 (1)	2 (1)	3 (11)	4 (2)	1 (1)	- (0)	1 (8)	1 (1)	3 (5)	3 (25)	6 (7)	3 (3)
014	Populus tremuloides	2 (23)	3 (44)	4 (23)	- (0)	3 (11)	3 (15)	2 (27)	1 (1)	- (0)	- (0)	- (0)	- (0)	3 (1)	1 (50)	- (0)	3 (3)
016	Pseudotsuga menziesii	5 (33)	6 (39)	9 (29)	7 (35)	5 (33)	10 (42)	8 (37)	5 (13)	1 (0)	- (0)	4 (23)	2 (31)	5 (4)	2 (32)	1 (63)	- (0)
	SHRUBS AND SUBSHRUBS																
102	Acer glabrum	- (0)	1 (1)	4 (2)	4 (2)	- (0)	3 (2)	1 (2)	- (0)	- (0)	- (0)	1 (3)	- (0)	1 (1)	- (0)	- (0)	- (0)
167	Acer grandidentatum	1 (1)	- (0)	1 (3)	- (0)	- (0)	- (0)	+ (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
104	Alnus sinuata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	2 (1)	3 (2)	4 (5)	6 (5)	6 (1)	7 (6)	5 (4)	1 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
201	Arctostaphylos uva-ursi	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	3 (1)	- (0)	1 (1)	- (0)
150	Artemisia tridentata	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (1)	4 (T)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
203	Berberis repens	5 (3)	4 (8)	6 (2)	6 (1)	3 (1)	8 (2)	9 (3)	3 (T)	- (0)	- (0)	2 (T)	1 (T)	4 (T)	1 (T)	4 (T)	- (0)
107	Ceanothus velutinus	- (0)	+ (0)	- (0)	1 (1)	- (0)	2 (1)	1 (6)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
173	Cercocarpus ledifolius	- (0)	- (0)	- (0)	- (0)	- (0)	2 (3)	+ (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
204	Clematis columbiana	2 (3)	- (0)	1 (1)	5 (3)	1 (1)	3 (2)	+ (1)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
112	Juniperus communis	3 (5)	- (0)	- (0)	2 (2)	1 (1)	- (0)	2 (2)	10 (19)	- (0)	- (0)	1 (1)	4 (2)	6 (1)	1 (3)	5 (2)	- (0)
113	Juniperus horizontalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
153	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
115	Lonicera utahensis	3 (5)	+ (1)	3 (2)	8 (4)	3 (1)	5 (11)	2 (5)	1 (1)	1 (1)	- (0)	3 (2)	1 (1)	1 (1)	2 (1)	1 (1)	- (0)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	1 (9)	5 (2)	10 (21)	8 (9)	4 (1)	10 (35)	9 (13)	1 (1)	5 (2)	2 (T)	7 (1)	1 (1)	2 (1)	5 (1)	5 (0)	- (0)
122	Physocarpus malvaceus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	- (0)	1 (1)	2 (19)	- (0)	- (0)	- (0)	2 (5)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
125	Purshia tridentata	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
128	Ribes cereum	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)
158	Ribes hudsonianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	3 (1)	+ (1)	- (0)	1 (1)	1 (8)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (15)	- (0)	1 ([illegible])	- (0)	- (0)
159	Ribes montigenum	4 (3)	3 (2)	3 (7)	3 (2)	1 (1)	- (0)	2 (2)	- (0)	10 (19)	10 (23)	4 (2)	5 (1)	2 (1)	6 ([illegible])	2 (1)	- (0)
131	Ribes viscosissimum	1 (1)	4 (2)	2 (1)	4 (1)	1 (1)	3 (1)	3 (1)	- (0)	- (0)	- (0)	3 (1)	- (0)	1 (1)	1 (1)	1 (1)	5 (2)
132	Rosa acicularis	2 (6)	- (0)	- (0)	1 (15)	1 (9)	- (0)	+ (1)	3 (1)	- (0)	- (0)	- (0)	2 (8)	- (0)	1 (1)	2 (1)	- (0)
161	Rosa nutkana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
134	Rosa woodsii	1 (1)	3 (1)	4 (2)	- (0)	1 (1)	2 (3)	4 (1)	1 (1)	- (0)	- (0)	2 (1)	2 (1)	1 (1)	1 (1)	1 (1)	- (0)
136	Rubus parviflorus	1 (2)	- (0)	3 (1)	3 (3)	1 (1)	2 (3)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
137	Salix scouleriana	- (0)	1 (0)	2 (2)	1 (1)	2 (3)	7 (3)	2 (5)	- (0)	- (0)	- (0)	1 (1)	- (0)	1 (3)	- (0)	- (0)	- (0)
139	Shepherdia canadensis	4 (4)	+ (3)	2 (20)	5 (4)	1 (2)	5 (1)	5 (6)	8 (10)	- (0)	1 (T)	4 (3)	4 (20)	10 (33)	2 (1)	5 (1)	- (0)
140	Sorbus scopulina	1 (1)	4 (5)	7 (1)	6 (2)	2 (1)	3 (3)	4 (3)	- (0)	1 (3)	- (0)	2 (1)	- (0)	1 (1)	1 (1)	- (0)	- (0)
142	Spiraea betulifolia	2 (7)	- (0)	- (0)	10 (34)	1 (1)	3 (2)	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
143	Symphoricarpos albus	2 (1)	- (0)	- (0)	- (0)	3 (2)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
163	Symphoricarpos oreophilus	4 (7)	8 (1)	7 (6)	4 (2)	6 (2)	7 (1)	8 (5)	- (0)	3 (1)	- (0)	5 (1)	- (0)	2 (1)	3 (1)	1 (1)	5 (1)
145	Vaccinium caespitosum	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	1 (1)	- (0)	- (0)	3 (1)	1 (1)	2 (1)	+ (1)	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
148	Vaccinium scoparium	1 (3)	- (0)	- (0)	1 (1)	1 (1)	- (0)	- (0)	- (0)	2 (1)	1 (T)	- (0)	3 (0)	1 (3)	- (0)	- (0)	- (0)
	FERNS AND ALLIES																
254	Equisetum arvensis	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	GRAMINOIDS																
301	Agropyron spicatum	- (0)	+ (15)	1 (1)	1 (1)	- (0)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
338	Bromus ciliatus	3 (5)	+ (1)	1 (1)	1 (1)	1 (1)	- (0)	1 (0)	1 (1)	- (0)	- (0)	- (0)	3 (4)	1 (1)	1 (1)	- (0)	- (0)
304	Bromus vulgaris	1 (3)	- (0)	- (0)	2 (3)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
305	Calamagrostis canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
307	Calamagrostis rubescens	6 (8)	3 (10)	4 (11)	4 (17)	10 (46)	10 (68)	1 (2)	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	3 (1)
339	Carex disperma	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	4 (18)	2 (8)	1 (37)	2 (37)	4 (12)	- (0)	1 (1)	1 (3)	1 (3)	1 (T)	2 (1)	- (0)	1 (3)	1 (19)	- (0)	- (0)
311	Carex rossii	3 (10)	7 (2)	2 (2)	4 (1)	3 (2)	2 (1)	5 (1)	6 (2)	5 (4)	8 (1)	7 (3)	3 (1)	7 (1)	7 (4)	9 (2)	10 (17)
316	Elymus glaucus	7 (5)	2 (2)	6 (2)	3 (1)	2 (1)	- (0)	3 (2)	- (0)	- (0)	- (0)	1 (1)	1 (0)	- (0)	2 (1)	1 (1)	- (0)
317	Festuca idahoensis	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	1 (1)	- (0)	1 (1)	1 (T)	- (0)	2 (2)	2 (1)	1 (3)	- (0)	- (0)
348	Hesperochloa kingii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (2)	3 (1)	1 (1)	6 (T)	- (0)	- (0)	1 (1)	- (0)	1 (1)	- (0)
321	Juncus drummondii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
323	Koeleria cristata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	4 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
325	Luzula hitchcockii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
349	Melica bulbosa	1 (3)	- (0)	1 (3)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
329	Oryzopsis asperifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
331	Poa nervosa	3 (8)	3 (4)	2 (1)	3 (1)	3 (2)	3 (1)	3 (5)	4 (5)	2 (1)	- (0)	3 (1)	5 (4)	3 (1)	5 (5)	4 (5)	3 (1)
360	Stipa occidentalis	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	- (0)	1 (1)	- (0)

(con.)

*Code to constancy values: + = 0- 5% 2 = 15-25% 4 = 35-45% 6 = 55-65% 8 = 75-85% 10 = 95-100%
1 = 5-15% 3 = 25-35% 5 = 45-55% 7 = 65-75% 9 = 85-95%

APPENDIX C-1

APPENDIX C-1 (con.)

ADP NO.	SERIES	ABIES LASIOCARPA															
	HABITAT TYPE	THOC	OSCH	OSCH	SPBE	CARU	CARU	BERE	JUCO	RIMO	RIMO	PERA	ARCO	ARCO	ARCO	ARCO	CARO
	PHASE		OSCH	PAMY		CARU	PAMY	BERE		RIMO	PIAL		PIEN	SHCA	ARCO	ASMI	
	NUMBER OF STANDS	n=16	n=23	n= 9	n=11	n=16	n- 6	n=48	n= 8	n=10	n= 8	n=18	n=12	n=10	n=17	n=11	n= 4
	FORBS																
401	Achillea millefolium	3 (5)	3 (2)	2 (1)	- (0)	5 (1)	2 (1)	2 (1)	3 (1)	4 (1)	6 (T)	2 (1)	4 (1)	2 (1)	2 (1)	1 (1)	8 (0)
402	Actaea rubra	1 (T)	1 (T)	1 (1)	2 (T)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
565	Aconitum columbianum	- (0)	- (0)	- (0)	- (0)	1 (37)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
404	Allium cernuum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
414	Antennaria microphylla	- (0)	- (0)	- (0)	1 (1)	1 (1)	2 (1)	+ (1)	5 (1)	1 (1)	1 (T)	- (0)	3 (0)	5 (1)	2 (1)	5 (8)	3 (1)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
413	Antennaria racemosa	2 (·6)	- (0)	- (0)	1 (3)	1 (3)	2 (3)	1 (4)	4 (2)	- (0)	- (0)	- (0)	3 (3)	2 (1)	1 (1)	3 (1)	- (0)
754	Aquilegia coerulea	2 (11)	5 (1)	7 (4)	4 (1)	1 (2)	- (0)	4 (1)	1 (1)	5 (3)	3 (T)	4 (1)	6 (1)	2 (1)	3 (4)	1 (1)	- (0)
420	Arenaria macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
421	Arnica cordifolia	10 (15)	6 (11)	8 (21)	9 (9)	9 (10)	8 (7)	9 (15)	10 (7)	6 (3)	3 (T)	9 (7)	10 (15)	10 (16)	10 (17)	10 (10)	8 (1)
422	Arnica latifolia	- (0)	+ (1)	3 (1)	- (0)	- (0)	- (0)	1 (2)	- (0)	1 (1)	- (0)	2 (1)	1 (3)	- (0)	- (0)	- (0)	- (0)
426	Aster conspicuus	4 (20)	- (0)	- (0)	2 (15)	2 (14)	- (0)	1 (12)	- (0)	- (0)	- (0)	1 (1)	1 (1)	1 (1)	2 (10)	3 (25)	- (0)
582	Aster engelmannii	4 (9)	4 (3)	8 (2)	5 (2)	4 (1)	5 (1)	5 (4)	1 (1)	3 (1)	4 (T)	8 (1)	- (0)	1 (1)	4 (1)	1 (1)	5 (1)
822	Aster glaucodes	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (2)	- (0)	4 (1)	1 (1)	1 (1)	- (0)
430	Astragalus miser	4 (2)	- (0)	- (0)	4 (1)	1 (2)	- (0)	1 (12)	6 (7)	- (0)	- (0)	- (0)	4 (3)	5 (14)	1 (1)	10 (14)	- (0)
817	Balsamorhiza macrophylla	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
431	Balsamorhiza sagittata	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)
843	Balsamorhiza incana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
769	Caltha leptosepala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
436	Campanula rotundifolia	1 (1)	- (0)	- (0)	1 (1)	1 (1)	- (0)	1 (1)	3 (1)	- (0)	- (0)	- (0)	1 (1)	5 (1)	1 (1)	4 (1)	- (0)
438	Castilleja miniata	1 (1)	- (0)	- (0)	- (0)	1 (1)	2 (1)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
594	Castilleja rhexifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
442	Chimaphila umbellata	1 (1)	+ (3)	- (0)	2 (1)	1 (1)	3 (8)	2 (4)	- (0)	- (0)	- (0)	1 (3)	- (0)	- (0)	1 (1)	- (0)	- (0)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
847	Cymopteris hendersonii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
455	Disporum trachycarpum	1 (2)	1 (1)	2 (1)	3 (1)	1 (1)	3 (2)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
459	Epilobium angustifolium	6 (5)	2 (1)	7 (1)	5 (1)	4 (1)	5 (1)	3 (1)	9 (1)	4 (10)	- (0)	3 (1)	8 (3)	7 (1)	5 (1)	7 (2)	3 (1)
465	Fragaria vesca	3 (5)	3 (2)	3 (7)	5 (1)	4 (2)	3 (2)	5 (3)	- (0)	1 (1)	- (0)	3 (1)	2 (1)	- (·0)	4 (1)	3 (1)	- (0)
466	Fragaria virginiana	3 (2)	1 (2)	2 (15)	2 (1)	4 (3)	- (0)	1 (4)	5 (1)	1 (1)	- (0)	2 (1)	3 (1)	3 (3)	2 (13)	3 (2)	3 (1)
616	Frasera speciosa	2 (2)	2 (1)	2 (1)	2 (2)	3 (2)	2 (1)	2 (1)	5 (1)	1 (1)	3 (T)	3 (1)	3 (1)	1 (1)	4 (1)	4 (0)	3 (1)
471	Galium triflorum	- (0)	1 (1)	2 (8)	2 (1)	2 (1)	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
620	Geranium richardsonii	6 (14)	1 (1)	1 (1)	- (0)	1 (1)	- (0)	+ (8)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (3)	1 (3)	3 (1)
473	Geranium viscosissimum	2 (5)	+ (1)	3 (11)	7 (1)	5 (3)	2 (3)	2 (2)	1 (1)	4 (1)	4 (T)	4 (1)	1 (1)	5 (3)	6 (1)	7 (1)	3 (1)
474	Geum triflorum	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (1)	2 (1)	1 (1)	- (0)	- (0)
476	Goodyera oblongifolia	2 (1)	1 (1)	3 (1)	5 (1)	2 (1)	7 (1)	2 (1)	- (0)	- (0)	- (0)	+ (1)	- (0)	- (0)	1 (1)	- (0)	- (0)
481	Heracleum lanatum	1 (1)	- (0)	- (0)	- (0)	1 (37)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	1 (1)	3 (3)	1 (1)	5 (1)	4 (1)	3 (2)	3 (1)	1 (1)	- (0)	- (0)	3 (1)	- (0)	2 (1)	4 (1)	5 (1)	3 (1)
486	Hieracium gracile	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
756	Ligusticum filicinum	1 (1)	2 (2)	2 (1)	2 (1)	1 (1)	2 (1)	1 (1)	- (0)	- (0)	- (0)	3 (1)	1 (3)	- (0)	1 (1)	- (0)	- (0)
639	Linum perenne	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	1 (9)	1 (2)	1 (1)	- (0)	3 (1)	3 (8)	+ (2)	- (0)	3 (1)	3 (1)	1 (1)	3 (1)	4 (1)	4 (5)	4 (5)	3 (3)
649	Mitella pentandra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	- (0)	3 (3)	7 (1)	2 (1)	2 (1)	2 (1)	3 (1)	- (0)	2 (1)	- (0)	10 (2)	1 (1)	- (0)	1 (1)	- (0)	- (0)
505	Osmorhiza chilensis	9 (8)	7 (15)	1 (15)	3 (1)	5 (1)	7 (1)	6 (2)	- (0)	2 (2)	3 (T)	5 (1)	2 (2)	- (0)	1 (3)	1 (0)	8 (1)
653	Osmorhiza depauperata	1 (1)	3 (19)	9 (15)	4 (2)	3 (1)	3 (1)	4 (2)	3 (1)	6 (1)	- (0)	4 (1)	3 (1)	3 (1)	6 (1)	5 (1)	3 (1)
507	Pedicularis bracteosa	3 (3)	+ (1)	- (0)	1 (1)	3 (1)	2 (1)	+ (0)	- (0)	2 (1)	1 (T)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
509	Pedicularis racemosa	3 (10)	3 (7)	1 (3)	2 (2)	4 (4)	2 (1)	5 (5)	- (0)	3 (1)	1 (T)	10 (10)	1 (T)	1 (T)	1 (T)	3 (T)	- (0)
513	Penstemon procerus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
669	Potentilla diversifolia	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	2 (0)	- (0)	- (0)	- (0)	- (0)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	1 (15)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	5 (5)	1 (2)	- (0)	4 (1)	1 (1)	- (0)	+ (0)	3 (1)	1 (1)	3 (T)	- (0)	3 (1)	1 (1)	2 (1)	- (0)	- (0)
702	Potentilla ovina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
526	Pyrola asarifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	+ (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	4 (2)	2 (1)	4 (5)	6 (1)	5 (1)	7 (1)	6 (2)	6 (1)	3 (5)	- (0)	6 (2)	9 (4)	7 (1)	4 (1)	7 (0)	5 (8)
676	Saxifraga arguta	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (3)	- (0)	1 (1)	- (0)	- (0)
681	Senecio streptanthifolius	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	3 (T)	1 (1)	3 (1)	- (0)	- (0)	- (0)	- (0)
539	Senecio triangularis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
541	Silene menziesii	- (0)	6 (5)	3 (1)	- (0)	4 (1)	- (0)	4 (1)	- (0)	1 (1)	- (0)	2 (1)	- (0)	- (0)	2 (1)	2 (1)	3 (3)
542	Smilacina racemosa	1 (2)	4 (1)	2 (1)	1 (1)	1 (1)	5 (1)	2 (1)	- (0)	1 (1)	- (0)	1 (1)	1 (1)	- (0)	- (0)	- (0)	- (0)
543	Smilacina stellata	3 (5)	+ (3)	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
684	Solidago multiradiata	4 (1)	- (0)	- (0)	- (0)	1 (3)	- (0)	+ (1)	6 (1)	2 (1)	4 (T)	- (0)	6 (1)	6 (1)	2 (1)	4 (1)	3 (1)
546	Streptopus amplexifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
714	Thalictrum fendleri	- (0)	6 (6)	7 (5)	2 (3)	4 (1)	3 (1)	6 (4)	- (0)	1 (3)	- (0)	4 (1)	1 (1)	- (0)	3 (1)	1 (1)	3 (1)
547	Thalictrum occidentale	10 (28)	+ (1)	2 (2)	3 (1)	1 (2)	- (0)	1 (1)	- (0)	- (0)	- (0)	1 (1)	1 (1)	- (0)	1 (3)	- (0)	- (0)
690	Trollius laxus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
550	Valeriana dioica and occidentalis	4 (2)	2 (2)	2 (1)	- (0)	1 (3)	- (0)	1 (1)	- (0)	1 (1)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)
554	Viola adunca	3 (2)	7 (3)	6 (2)	3 (1)	8 (1)	2 (1)	3 (2)	1 (1)	1 (1)	- (0)	2 (1)	2 (1)	1 (1)	1 (1)	- (0)	3 (1)
555	Viola canadensis	1 (3)	1 (1)	- (0)	1 (1)	- (0)	- (0)	+ (8)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
693	Viola nuttallii	- (0)	2 (1)	- (0)	- (0)	1 (1)	- (0)	1 (1)	- (0)	2 (1)	- (0)	2 (1)	- (0)	- (0)	3 (1)	2 (1)	5 (2)
557	Viola orbiculata	1 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	+ (1)	- (0)	- (0)	- (0)	- (0)	1 (2)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

(con.)

APPENDIX C-1

APPENDIX C-1

Constancy* and average canopy coverage (percent) of important plants in eastern Idaho-western Wyoming habitat types and phases

ADP NO.	SERIES HABITAT TYPE PHASE NUMBER OF STANDS	PINUS ALBICAULIS VASC n= 9	 CAGE n= 3	 JUCO SHCA n= 3	 JUCO JUCO n=15	 CARO PICO n=17	 CARO CARO n= 3	 FEID n= 3
	TREES							
002	Abies lasiocarpa	3 (4)	3 (1)	- (0)	1 (0)	2 (3)	3 (1)	- (0)
007	Picea engelmannii	4 (2)	- (0)	3 (1)	1 (0)	- (0)	7 (1)	3 (3)
008	Picea glauca	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
022	Picea pungens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
009	Pinus albicaulis	10 (51)	10 (34)	10 (1)	7 (15)	9 (22)	10 (70)	10 (38)
010	Pinus contorta	9 (33)	3 (63)	10 (48)	10 (50)	10 (49)	- (0)	3 (3)
011	Pinus flexilis	- (0)	- (0)	3 (3)	1 (8)	2 (1)	- (0)	- (0)
014	Populus tremuloides	- (0)	- (0)	6 (1)	1 (0)	1 (1)	- (0)	3 (0)
016	Pseudotsuga menziesii	- (0)	3 (3)	3 (0)	1 (0)	- (0)	- (0)	- (0)
	SHRUBS and SUBSHRUBS							
102	Acer glabrum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
167	Acer grandidentatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
104	Alnus sinuata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
105	Amelanchier alnifolia	- (0)	- (0)	3 (1)	1 (1)	- (0)	- (0)	- (0)
201	Arctostaphylos uva-ursi	- (0)	- (0)	3 (1)	5 (4)	1 (0)	- (0)	- (0)
150	Artemisia tridentata	- (0)	3 (1)	- (0)	- (0)	1 (0)	- (0)	3 (3)
203	Berberis repens	- (0)	- (0)	7 (1)	- (0)	- (0)	- (0)	- (0)
107	Ceanothus velutinus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
173	Cercocarpus ledifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
204	Clematis columbiana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
112	Juniperus communis	2 (3)	3 (1)	10 (1)	7 (5)	4 (0)	3 (0)	3 (0)
153	Juniperus horizontalis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
113	Ledum glandulosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
206	Linnaea borealis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
115	Lonicera utahensis	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
116	Menziesia ferruginea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
118	Pachistima myrsinites	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
122	Physocarpus malvaceus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
169	Physocarpus monogynus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
124	Prunus virginiana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
125	Purshia tridentata	- (0)	- (0)	- (0)	2 (5)	- (0)	- (0)	- (0)
128	Ribes cereum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
158	Ribes hudsonianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
130	Ribes lacustre	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
159	Ribes montigenum	1 (3)	- (0)	- (0)	1 (1)	1 (0)	3 (1)	3 (3)
131	Ribes viscosissimum	- (0)	- (0)	3 (1)	1 (1)	- (0)	- (0)	- (0)
132	Rosa acicularis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
161	Rosa nutkana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
134	Rosa woodsii	- (0)	- (0)	- (0)	2 (1)	- (0)	- (0)	- (0)
136	Rubus parviflorus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
137	Salix scouleriana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
139	Shepherdia canadensis	- (0)	- (0)	10 (8)	5 (1)	1 (1)	- (0)	- (0)
140	Sorbus scopulina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
142	Spiraea betulifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
143	Symphoricarpos albus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
163	Symphoricarpos oreophilus	- (0)	3 (3)	- (0)	- (0)	1 (1)	- (0)	- (0)
145	Vaccinium caespitosum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
146	Vaccinium globulare	2 (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
148	Vaccinium scoparium	10 (41)	- (0)	- (0)	1 (0)	2 (0)	3 (0)	3 (1)
	FERNS and ALLIES							
254	Equisetum arvensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
	GRAMINOIDS							
301	Agropyron spicatum	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	7 (1)
338	Bromus ciliatus	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)	- (0)
304	Bromus vulgaris	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
305	Calamagrostis canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
307	Calamagrostis rubescens	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
339	Carex disperma	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
309	Carex geyeri	2 (33)	10 (38)	- (0)	- (0)	1 (2)	- (0)	- (0)
311	Carex rossii	7 (1)	3 (3)	3 (1)	8 (1)	9 (3)	7 (0)	3 (1)
316	Elymus glaucus	2 (2)	3 (3)	- (0)	- (0)	- (0)	- (0)	- (0)
317	Festuca idahoensis	1 (1)	10 (3)	3 (1)	2 (1)	4 (1)	- (0)	10 (11)
348	Hesperochloa kingii	- (0)	- (0)	3 (1)	1 (3)	- (0)	3 (1)	3 (3)
321	Juncus drummondii	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
323	Koeleria cristata	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
325	Luzula hitchcockii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
326	Luzula parviflora	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
349	Melica bulbosa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
329	Oryzopsis asperifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
331	Poa nervosa	7 (6)	7 (3)	6 (1)	6 (6)	9 (3)	3 (15)	7 (1)
330	Stipa occidentalis	- (0)	10 (1)	7 (1)	- (0)	1 (1)	- (0)	- (0)

*Code to constancy values: + = 0- 5% 2 = 15-25% 4 = 35-45% 6 = 55-65% 8 = 75-85% 10 = 95-100%
1 = 5-15% 3 = 25-35% 5 = 45-55% 7 = 65-75% 9 = 85-95%

(con.)

APPENDIX C-1

APPENDIX C-1 (con.)

ADP NO.	SERIES / HABITAT TYPE / PHASE / NUMBER OF STANDS	PINUS ALBICAULIS						
	HABITAT TYPE	VASC	CAGE	JUCO	JUCO	CARO	CARO	FEID
	PHASE			SHCA	JUCO	PICO	CARO	
	NUMBER OF STANDS	n= 9	n= 3	n= 3	n=15	n=17	n= 3	n= 3
	FORBS							
401	Achillea millefolium	2 (1)	10 (3)	7 (1)	3 (1)	3 (1)	3 (1)	7 (1)
402	Actaea rubra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
565	Aconitum columbianum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
404	Allium cernuum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
409	Antennaria anaphaloides	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
414	Antennaria microphylla	2 (2)	7 (2)	7 (1)	6 (0)	8 (1)	3 (1)	10 (1)
573	Antennaria parvifolia	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
413	Antennaria racemosa	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
754	Aquilegia coerulea	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
420	Arenaria macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
421	Arnica cordifolia	7 (3)	7 (15)	10 (13)	8 (2)	5 (1)	7 (3)	7 (1)
422	Arnica latifolia	3 (6)	- (0)	- (0)	1 (3)	- (0)	7 (2)	- (0)
426	Aster conspicuus	1 (3)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
582	Aster engelmannii	3 (2)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
822	Aster glaucodes	- (0)	- (0)	7 (1)	1 (1)	- (0)	- (0)	- (0)
430	Astragalus miser	1 (3)	- (0)	3 (38)	6 (21)	- (0)	7 (1)	7 (19)
817	Balsamorhiza macrophylla	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
431	Balsamorhiza sagittata	- (0)	- (0)	3 (1)	- (0)	- (0)	- (0)	- (0)
843	Balsamorhiza incana	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
769	Caltha leptosepala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
436	Campanula rotundifolia	- (0)	10 (1)	7 (1)	3 (1)	1 (1)	3 (0)	3 (1)
438	Castilleja miniata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
594	Castilleja rhexifolia	1 (3)	3 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
442	Chimaphila umbellata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
599	Clematis pseudoalpina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
600	Clematis tenuiloba	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
602	Crepis acuminata	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	3 (1)
847	Cymopteris hendersonii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
455	Disporum trachycarpum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
459	Epilobium angustifolium	3 (1)	7 (3)	7 (1)	3 (3)	4 (1)	10 (1)	7 (1)
465	Fragaria vesca	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
466	Fragaria virginiana	1 (1)	3 (1)	3 (3)	- (0)	1 (2)	- (0)	- (0)
616	Frasera speciosa	- (0)	7 (3)	3 (1)	1 (1)	- (0)	- (0)	3 (1)
471	Galium triflorum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
620	Geranium richardsonii	1 (1)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
473	Geranium viscosissimum	- (0)	- (0)	3 (1)	- (0)	1 (1)	- (0)	- (0)
474	Geum triflorum	- (0)	7 (2)	3 (0)	- (0)	1 (0)	- (0)	3 (3)
476	Goodyera oblongifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
481	Heracleum lanatum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
484	Hieracium albiflorum	- (0)	3 (3)	- (0)	- (0)	1 (1)	- (0)	- (0)
486	Hieracium gracile	2 (2)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
756	Ligusticum filicinum	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
639	Linum perenne	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
641	Lupinus argenteus	- (0)	- (0)	10 (1)	1 (8)	4 (4)	- (0)	3 (15)
649	Mitella pentandra	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
502	Mitella stauropetala	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
505	Osmorhiza chilensis	- (0)	- (0)	- (0)	1 (3)	1 (1)	- (0)	- (0)
653	Osmorhiza depauperata	1 (1)	- (0)	7 (1)	1 (1)	1 (1)	- (0)	- (0)
507	Pedicularis bracteosa	2 (8)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
509	Pedicularis racemosa	1 (3)	7 (1)	- (0)	- (0)	- (0)	- (0)	- (0)
513	Penstemon procerus	1 (1)	- (0)	- (0)	- (0)	- (0)	7 (0)	- (0)
669	Potentilla diversifolia	4 (1)	- (0)	- (0)	1 (1)	1 (1)	7 (1)	3 (3)
521	Potentilla flabellifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
670	Potentilla gracilis	- (0)	7 (2)	3 (1)	1 (1)	1 (1)	- (0)	- (0)
702	Potentilla ovina	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
526	Pyrola asarifolia	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
529	Pyrola secunda	1 (1)	- (0)	3 (0)	3 (2)	2 (0)	- (0)	- (0)
676	Saxifraga arguta	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
840	Senecio lugens	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
681	Senecio streptanthifolius	- (0)	3 (1)	- (0)	2 (1)	1 (1)	- (0)	3 (1)
539	Senecio triangularis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
541	Silene menziesii	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
542	Smilacina racemosa	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
543	Smilacina stellata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
684	Solidago multiradiata	2 (1)	10 (11)	7 (1)	5 (1)	4 (1)	10 (1)	7 (1)
546	Streptopus amplexifolius	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
714	Thalictrum fendleri	1 (37)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
547	Thalictrum occidentale	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
690	Trollius laxus	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
550	Valeriana dioica and occidentalis	- (0)	7 (9)	- (0)	- (0)	- (0)	- (0)	- (0)
554	Viola adunca	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
555	Viola canadensis	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
693	Viola nuttallii	- (0)	- (0)	- (0)	- (0)	1 (1)	- (0)	- (0)
557	Viola orbiculata	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
694	Viola purpurea	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
558	Xerophyllum tenax	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)

APPENDIX C-2. PRESENCE LIST: NUMBERS OF SAMPLE

(see pocket inside back cover)

APPENDIX D-1. SUBSTRATE FEATURES OF EASTERN IDAHO-WESTERN WYOMING HABITAT TYPES AND PHASES

Series	PINUS FLEXILIS				PSEUDOTSUGA MENZIESII																	
Habitat type	HEKI	FEID	CELE	JUCO	SYOR	ARCO	ARCO	CELE	JUCO	BERE	BERE	BERE	CARU	CARU	SPBE	SPBE	OSCH	SYAL	VAGL	ACGL	PHMA	PHMA
Phase		FEID				ARCO	ASMI			SYOR	JUCO	BERE	PAMY	CARU	CARU	SPBE		SYAL	VAGL	PAMY	PAMY	PSME
No. of samples	n=16	n=1	n=3	n=5	n=11	n=12	n=3	n=3	n=17	n=3	n=4	n=7	n=7	n=7	n=2	n=2	n=7	n=9	n=1	n=10	n=4	n=3
COARSE FRAGMENT TYPES (percent of samples)																						
SEDIMENTARY																						
Calcareous	38	.	.	40	27	42	.	33	41	67	75	43	43	14	.	50	.	22	.	30	50	33
Sandstone	6	100	.	.	18	8	.	67	29	.	25	14	29	43	.	50	44	45	.	40	25	.
Miscellaneous	.	.	.	.	.	8	33	.	12	33	.	29	14	29	.	.	28	11	.	10	25	.
METAMORPHIC																						
Quartzite	.	.	.	.	.	.	.	.	6	.	.	.	.	.	50	.	28	.	.	10	.	.
Gneiss & Schist	.	.	.	.	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IGNEOUS																						
Basalt & Andesite	19	.	.	20	.	.	.	.	.	.	.	.	.	.	50	.	.	11	100	10	.	67
Dacite, Trachyte & Latite	.	.	.	.	.	.	.	.	.	.	.	14	.	.	.	.	.	.	.	.	.	.
Rhyolite	6	.	.	.	.	8	.	.	.	.	.	.	14	.	.	.	.	.	.	.	.	.
Other volcanics	6	.	.	.	.	.	33	.	6	.	.	.	.	.	.	.	.	11	.	.	.	.
Quartz monzonite & Granite	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Granitics (undifferentiated)	.	.	.	20	54	17	33	.	6	.	.	.	.	.	.	.	.	.	.	.	.	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MIXED	25	.	.	20	.	8	.	.	.	.	.	.	.	14	.	.	.	.	.	.	.	.
SUBSTRATE CHARACTERISTICS																						
EXPOSED ROCK (mean %)	5.1	0.9	19.7	6.6	9.7	1.9	10.4	5.1	6.0	0.8	9.0	1.9	0.5	0.8	.	.	0.2	1.3	.	0.9	2.3	.
EXPOSED SOIL (mean %)	4.3	0.5	4.2	0.4	0.9	0.6	0.7	2.4	0.3	1.6	0.5	1.1	1.3	0.4	.	.	1.4	0.3	.	0.5	1.5	.
LITTER DEPTH (mean cm)	2.6	1.0	3.3	3.8	2.8	2.8	2.7	2.5	3.4	1.4	3.0	4.6	2.6	4.1	.	.	4.1	4.5	.	4.5	5.7	.
REACTION (mean pH)	7.0	.	.	6.3	6.4	6.5	6.8	7.2	6.6	.	6.6	6.5	5.6	6.4	.	.	6.0	6.7	.	6.6	38.0	.
GRAVEL CONTENT (mean %)	33.7	.	.	10.1	23.3	17.0	29.3	41.0	22.0	.	20.0	18.7	25.1	18.1	.	.	13.8	25.1	.	14.2	7.0	.

(con.)

APPENDIX D-1 (con.)

Series	PICEA ENGELMANNII										PINUS ALBICAULIS						
Habitat type	HYRE	ARCO	RIMO	JUCO	VASC	LIBO	GATR	CADI	CALE	EQAR	VASC	CAGE	JUCO	JUCO	CARO	CARO	FEID
Phase													SHCA	JUCO	PICO	CARO	
No. of Samples	n=11	n=15	n=4	n=21	n=7	n=2	n=5	n=1	n=8	n=7	n=2	n=0	n=6	n=14	n=12	n=2	n=3
COARSE FRAGMENT TYPES (percent of samples)																	
SEDIMENTARY																	
Calcareous	9	20	50	33	.	.	20	.	.	.	.	.	.	.	.	.	.
Sandstone	.	.	.	5	14	.	20	.	.	.	.	.	17	21	17	.	.
Miscellaneous	.	13	25	14	.	50	40	.	.	.	.	.	17	.	.	.	.
METAMORPHIC																	
Quartzite	.	7	.	.	14	.	20	.	12	.	.	.	.	.	8	.	.
Gneiss & Schist	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IGNEOUS																	
Basalt & Andesite	9	7	.	9	.	50	.	.	.	.	.	.	33	7	17	.	.
Dacite, Trachyte & Latite	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhyolite	18	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	33
Other Volcanics	45	33	.	14	.	.	.	.	.	.	.	.	.	7	.	.	.
Quartz monzonite & Granite	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	33
Granitics (undifferentiated)	18	7	25	5	43	.	.	100	63	.	50	.	17	64	58	50	.
Miscellaneous	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.
MIXED	.	13	.	9	29	.	.	.	25	.	50	.	17	.	.	50	33
SUBSTRATE CHARACTERISTICS																	
EXPOSED ROCK (mean %)	4.4	0.4	1.8	0.7	4.3	0.5	0.1	0.5	0.2	0.0	.	.	4.5	5.8	4.7	1.0	0.8
EXPOSED SOIL (mean %)	0.5	0.3	0.2	0.4	0.9	0.3	0.1	0.1	0.1	0.1	.	.	0.4	1.9	1.2	0.3	0.5
LITTER DEPTH (mean cm)	5.3	7.2	6.0	4.2	3.7	5.5	12.2	15.5	11.0	13.7	.	.	1.8	3.1	3.4	5.2	2.9
REACTION (mean pH)	6.1	5.8	6.2	6.4	5.2	.	7.1	.	5.7	7.1	.	.	5.5	5.7	5.4	5.8	6.2
GRAVEL CONTENT (mean %)	35.5	17.8	9.4	25.5	17.8	.	25.3	.	11.0	.	.	.	14.2	21.3	17.0	22.0	31.3

APPENDIX D-1 (con.)

Series	ABIES LASIOCARPA													
Habitat type	CACA	ACRU	PHMA	ACGL	LIBO	LIBO	VAGL	VAGL	VAGL	VASC	VASC	VASC	ARLA	SYAL
Phase	CACA			PAMY	VASC	LIBO	VASC	PAMY	VAGL	CARU	PIAL	VASC		
No. of samples	n=1	n=4	n=4	n=7	n=3	n=7	n=2	n=15	n=0	n=4	n=9	n=34	n=3	n=10
COARSE FRAGMENT TYPES (percent of samples)														
SEDIMENTARY														
Calcareous	.	50	.	29	.	.	.	.	.	.	.	.	.	20
Sandstone	.	25	100	57	100	.	50	60	.	50	22	50	33	50
Miscellaneous	.	25	.	14	.	.	.	7	.	25	.	3	.	20
METAMORPHIC														
Quartzite	100	.	.	.	.	29	.	7	.	25	11	18	33	.
Gneiss & Schist	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IGNEOUS														
Basalt & Andesite	.	.	.	.	.	57	.	7	.	.	11	.	33	10
Dacite, Trachyte & Latite	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhyolite	.	.	.	.	.	.	.	7	.	.	.	.	.	.
Other volcanics	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Quartz monzonite & Granite	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Granitics (undifferentiated)	.	.	.	.	.	14	.	7	.	.	45	23	.	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MIXED	.	.	.	.	.	.	50	7	.	.	11	6	.	.
SUBSTRATE CHARACTERISTICS														
EXPOSED ROCK (mean %)	.	.05	1.1	0.4	0.	1.1	0.	2.9	.	0.1	4.6	2.1	5.5	0.04
EXPOSED SOIL (mean %)	.	.05	0.2	0.3	0.2	0.5	0.7	0.3	.	0.6	0.3	0.1	0.3	0.2
LITTER DEPTH (mean cm)	.	4.9	4.5	3.8	6.0	6.1	4.2	4.1	.	3.7	3.9	4.0	4.3	4.6
REACTION (mean pH)	.	6.4	6.5	5.7	5.2	6.0	5.3	5.3	.	5.2	4.8	5.1	5.3	6.0
GRAVEL CONTENT (mean %)	.	1.0	16.5	20.6	16.1	15.2	9.7	16.7	.	16.5	32.0	21.0	14.0	16.8

(con.)

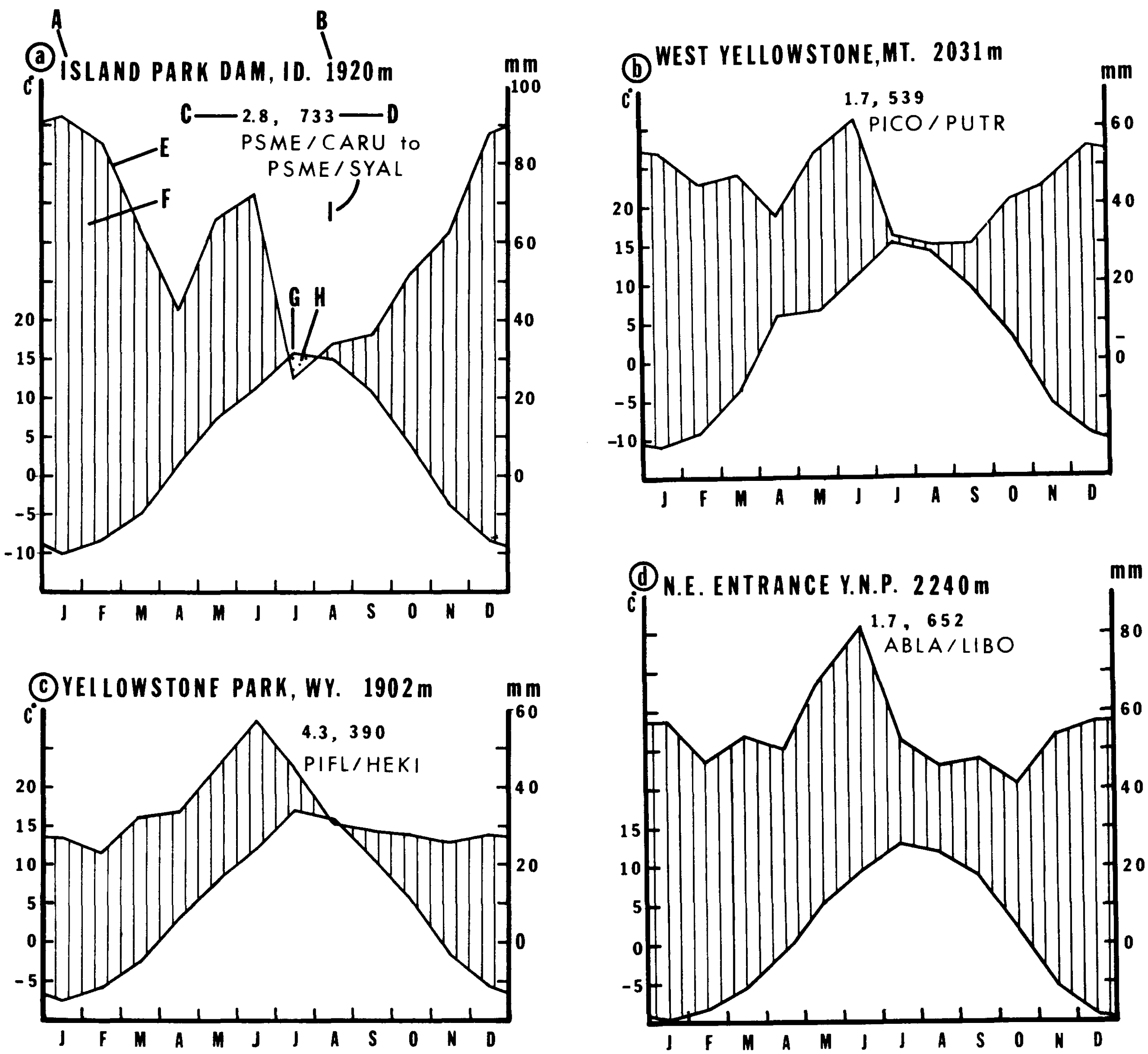
APPENDIX D-1 (con.)

Series	ABIES LASIOCARPA														
Habitat type Phase No. of samples	THOC n=2	OSCH PAMY n=4	OSCH OSCH n=4	SPBE n=6	CARU PAMY n=3	CARU CARU n=5	BERE BERE n=15	JUCO n=10	RIMO n=7	PERA n=9	ARCO PIEN n=4	ARCO SHCA n=10	ARCO ASMI n=10	ARCO ARCO n=22	CARO n=4
COARSE FRAGMENT TYPES (percent of samples)															
SEDIMENTARY															
Calcareous	.	25	25	17	.	.	20	10	.	22	.	.	20	.	.
Sandstone	.	25	.	67	67	80	40	20	71	55	25	40	30	32	25
Miscellaneous	50	.	25	.	.	.	7	10	.	11	.	20	.	5	.
METAMORPHIC															
Quartzite	50	25	25	.	33	.	7	.	14	.	25	.	10	27	50
Gneiss & Schist	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
IGNEOUS															
Basalt & Andesite	.	.	.	.	.	.	13	10	.	.	50	.	20	18	.
Dacite, Trachyte & Latite	.	.	25	.	.	20	.	.	.	.	.	.	.	14	.
Ryolite	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other volcanics	.	.	.	.	.	.	.	.	.	11	.	.	.	.	.
Quartz monzonite & Granite	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Granitics (undifferentiated)	.	.	.	17	.	.	13	50	14	.	.	30	20	5	.
Miscellaneous	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MIXED	.	25	.	.	.	.	.	.	.	.	.	10	.	.	25
SUBSTRATE CHARACTERISTICS															
EXPOSED ROCK (mean %)	0.1	0.4	1.2	3.3	3.0	0.4	3.0	1.7	2.0	1.5	0.1	3.4	0.5	1.2	0.4
EXPOSED SOIL (mean %)	0.1	0.2	1.5	1.0	0.5	1.4	0.5	0.8	1.2	0.9	0.1	0.4	0.1	0.9	1.0
LITTER DEPTH (mean cm)	4.2	3.0	4.2	3.0	4.8	3.0	4.2	3.4	5.0	3.4	5.3	3.0	3.9	3.0	1.6
REACTION (mean pH)	6.1	6.5	5.7	6.0	6.0	5.7	5.8	5.9	4.8	5.6	5.6	5.7	5.6	5.2	5.7
GRAVEL CONTENT (mean %)	10.0	16.0	22.3	19.6	18.5	8.4	21.3	16.0	22.0	24.4	12.5	17.0	27.0	28.0	13.5

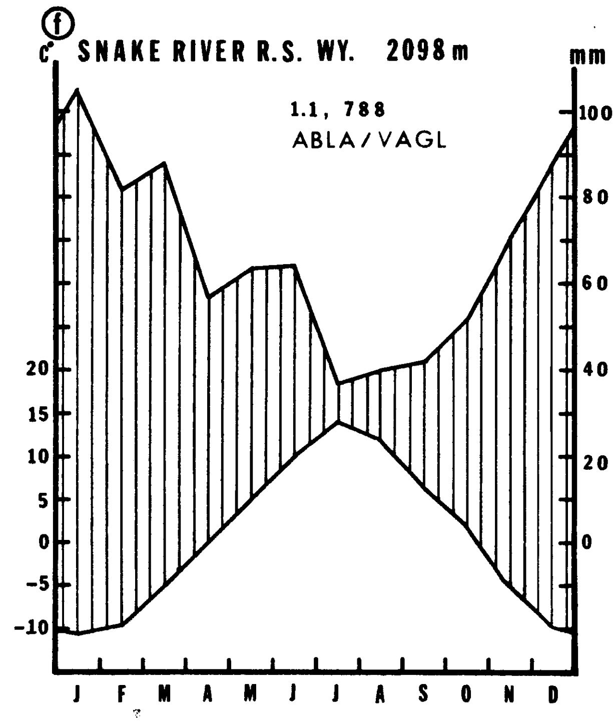
(con.)

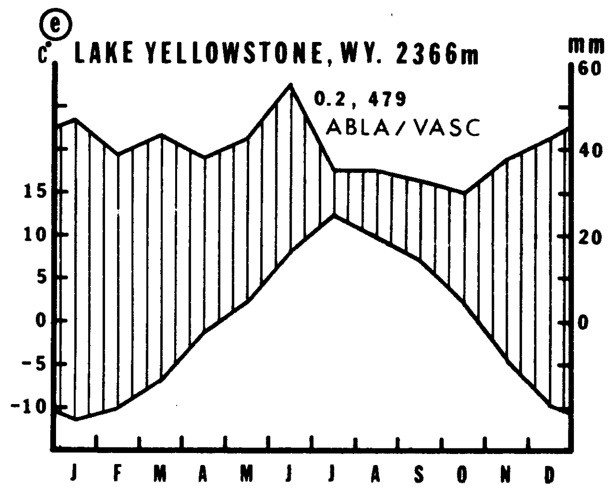
APPENDIX D-2. CLIMATIC PARAMETERS FOR WEATHER STATION WITHIN SELECTED HABITAT TYPES IN EASTERN AND WESTERN WYOMING

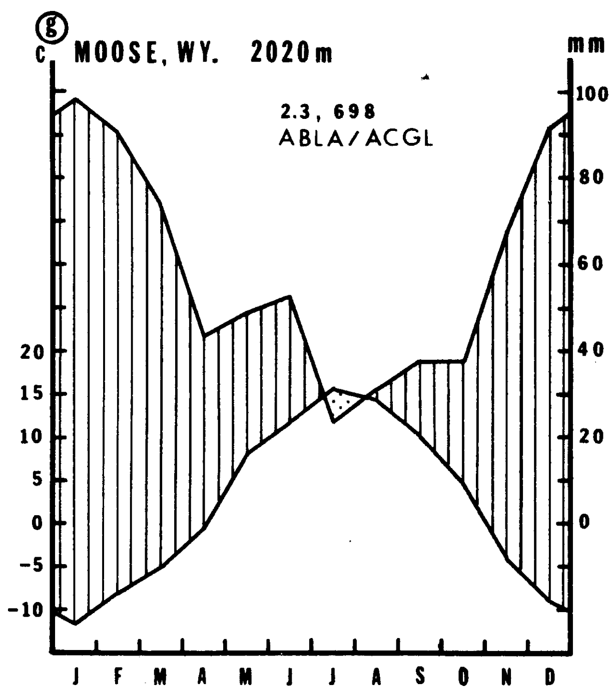
A. Station location
B. Elevation (m)
C. Mean annual temperature (°C)
D. Mean annual precipitation (mm)
E. Pattern of mean monthly precipitation (mm)
F. Hypothetical humid period; precipitation exceeding temperature at scale of 10°C/20mm
G. Pattern of mean monthly temperature (°C)
H. Hypothetical arid period I. Habitat type or community type for station or close proximity thereto

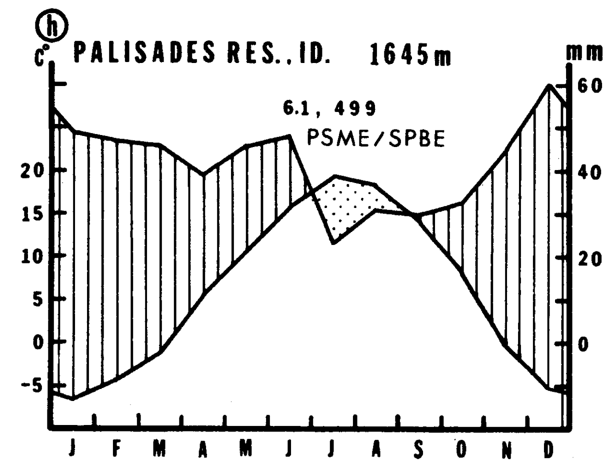


APPENDIX D-2. (con.)









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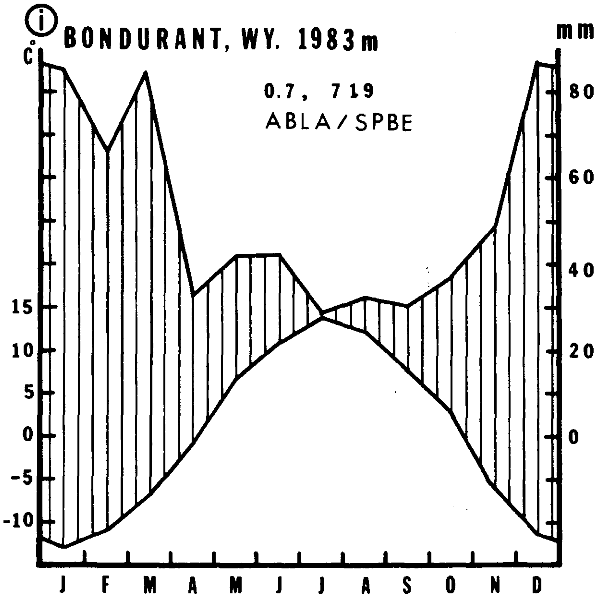
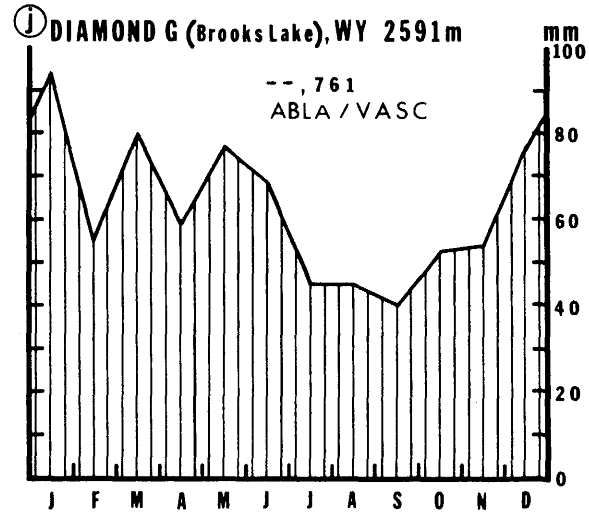
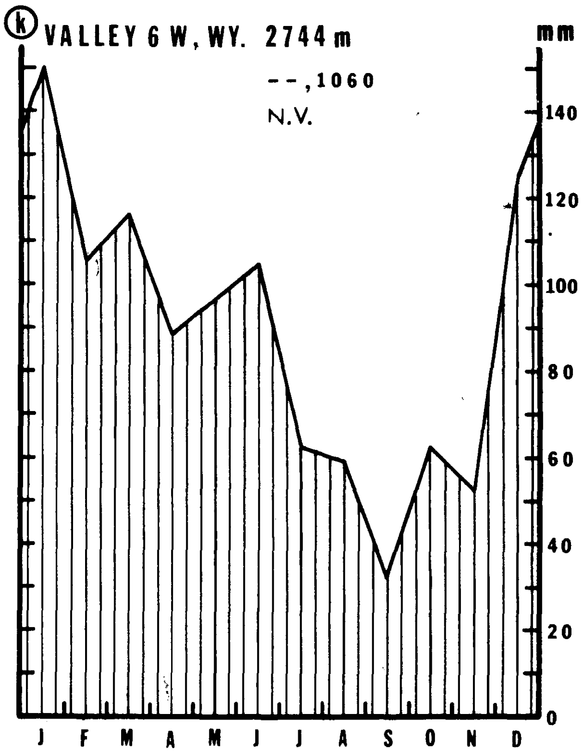
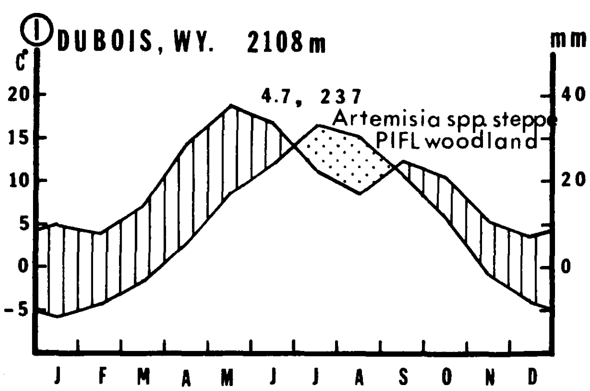
APPENDIX D-2. (con.)

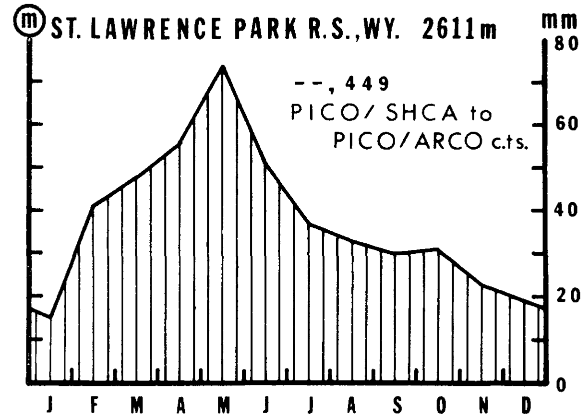


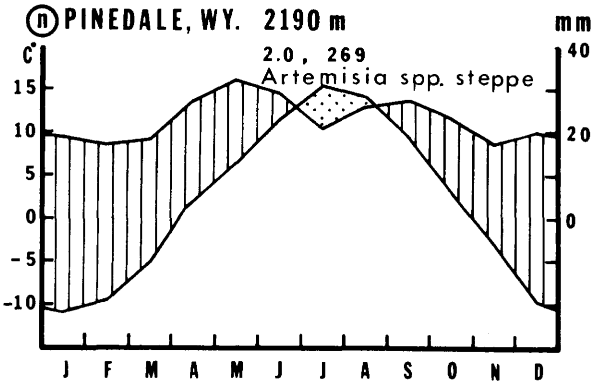


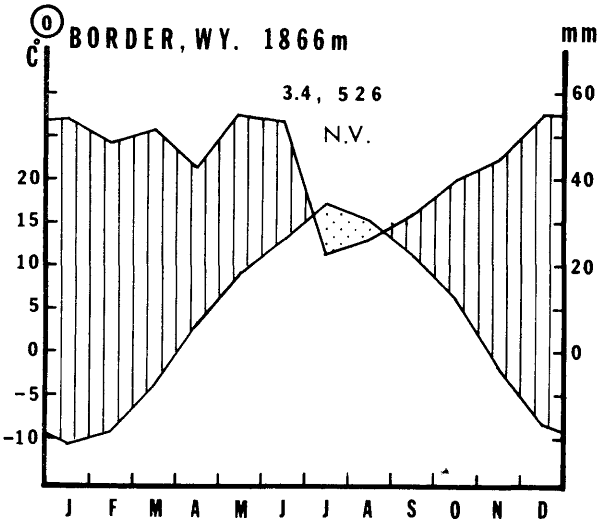


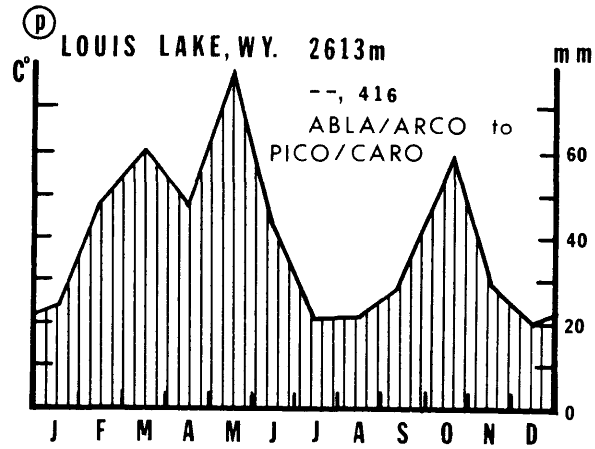


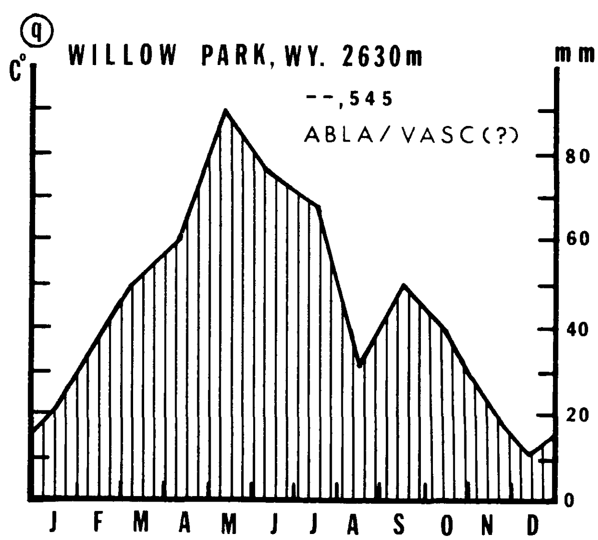
APPENDIX D-2. (con.)











APPENDIX E-1. MEAN BASAL AREAS AND 50-YEAR SITE INDEXES FOR EASTERN IDAHO-WESTERN WYOMING BY HABITAT TYPE.

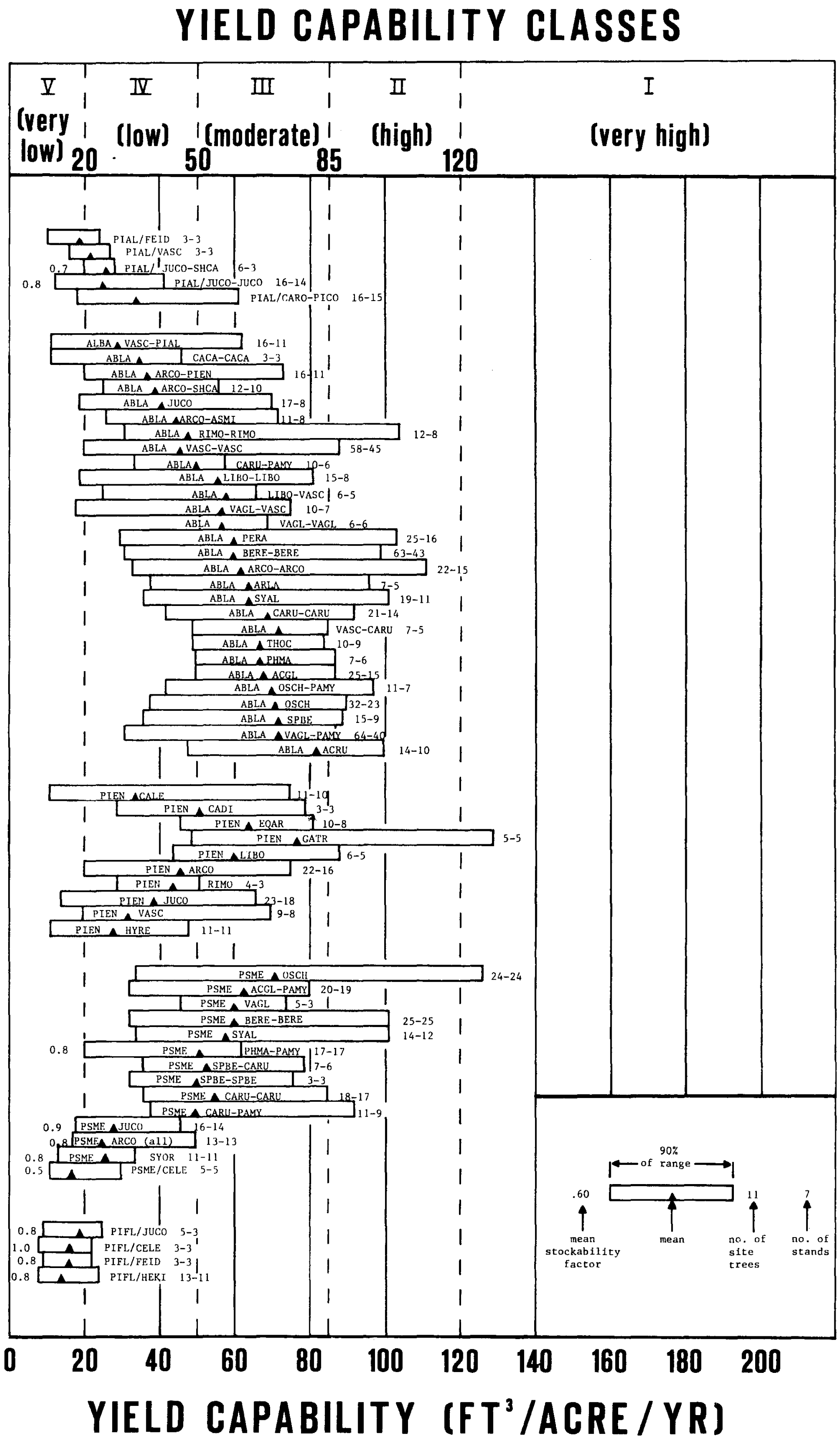
Means are shown where n = 3 or more; confidence limits (95 percent) for estimating the mean are given where n = 5 or more

	Basal area	Site index by species				
Habitat type, phase	(ft^2/acre)	PSME	PICO	PIEN	ABLA	PIAL/PIFL
PIFL/HEKI	121 ± 25	25 ±	10 ±	.	.	.
PIFL/FEID	133 ± ?	.	.	.	.	.
PIFL/CELE	136 ± ?	16 ± ?	.	.	.	.
PIFL/JUCO	147 ± 71	.	.	.	.	.
PSME/SYOR	130 ± 30	32 ± 6	.	.	.	.
PSME/ARCO, ARCO	158 ± 20	32 ± 8	.	.	.	.
PSME/ARCO, ASMI	106 ± ?	30 ± ?	.	.	.	.
PSME/CELE	91 ± 45	36 ± 13	.	.	.	.
PSME/JUCO	160 ± 22	28 ± 5	37 ± ?	.	.	.
PSME/BERE, SYOR	119 ± ?	45 ± ?	.	.	.	.
PSME/BERE, JUCO	.	34 ± ?	.	.	.	.
PSME/BERE, BERE	172 ± 27	51 ± 5	.	.	.	.
PSME/CARU, PAMY	114 ± 33	51 ± 9	.	.	.	.
PSME/CARU, CARU	190 ± 22	47 ± 5	.	.	.	.
PSME/SPBE, CARU	201 ± 41	48 ± 11	.	.	.	.
PSME/SPBE, SPBE	208 ± 55	44 ± ?	.	.	.	.
PSME/OSCH	164 ± 32	56 ± 5	.	.	.	.
PSME/SYAL, SYAL	167 ± 25	50 ± 9	.	.	.	.
PSME/VAGL, VAGL	145 ± ?	51 ± ?	49 ± ?	.	.	.
PSME/ACGL, PAMY	194 ± 40	53 ± 5	.	.	.	.
PSME/PHMA, PAMY	168 ± 30	48 ± 4	.	.	.	.
PSME/PHMA, PSME	198 ± ?	.	.	.	.	.
PIEN/HYRE	233 ± 8	.	.	27 ± 8	.	.
PIEN/ARCO	210 ± 19	33 ± ?	31 ± ?	39 ± 8	.	.
PIEN/RIMO	205 ± ?	.	.	36 ± ?	.	.
PIEN/JUCO	159 ± 19	23 ± 8	37 ± ?	35 ± 7	.	.
PIEN/VASC	229 ± 62	.	37 ± ?	35 ± 7	.	.
PIEN/LIBO	202 ± 55	.	41 ± ?	52 ± ?	.	.
PIEN/GATR	285 ± 133	.	.	56 ± 20	.	.
PIEN/CADI	241 ± ?	.	.	42 ± ?	.	.
PIEN/CALE	195 ± 27	.	.	32 ± 8	.	.
PIEN/EQAR	241 ± 78	.	.	51 ± 7	35 ± ?	.

APPENDIX E-1 (con.)

Habitat type, phase	Basal area (ft²/acre)	Site index by species PSME	PICO	PIEN	ABLA	PIAL/PIFL
ABLA/CACA, CACA	182 ± ?	.	.	.	.	.
ABLA/ACRU	209 ± 33	.	68 ± ?	50 ± 11	61 ± ?	.
ABLA/PHMA	191 ± 29	43 ± 19	.	.	.	.
ABLA/ACGL, PAMY	156 ± 7	54 ± 7	46 ± 11	53 ± ?	55 ± ?	
ABLA/LIBO, VASC	189 ± 74	.	45 ± ?	41 ± ?	.	.
ABLA/LIBO, LIBO	221 ± 41	41 ± ?	41 ± ?	40 ± 11	37 ± ?	.
ABLA/VAGL, VASC	202 ± 67	.	.	43 ± 15	.	.
ABLA/VAGL, PAMY	194 ± 21	44 ± 5	45 ± 6	48 ± 4	42 ± 9	.
ABLA/VAGL, VAGL	228 ± 82	51 ± ?	50 ± ?	55 ± ?	.	.
ABLA/VASC, CARU	111 ± 39	.	52 ± 8	.	.	.
ABLA/VASC, PIAL	223 ± 36	.	28 ± ?	37 ± 6	25 ± 4	.
ABLA/VASC, VASC	209 ± 27	.	37 ± 5	40 ± 5	33 ± 4	.
ABLA/ARLA	229 ± 60	37 ± ?	42 ± ?	45 ± 8	28 ± 8	.
ABLA/SYAL	136 ± 24	48 ± ?	50 ± 9	63 ± ?	54 ± 9	.
ABLA/THOC	261 ± 44	.	49 ± ?	51 ± 4	.	.
ABLA/OSCH, PAMY	250 ± 60	49 ± ?	53 ± ?	.	53 ± ?	.
ABLA/OSCH, OSCH	204 ± 30	47 ± 4	50 ± 8	.	46 ± 9	.
ABLA/SPBE	175 ± 27	50 ± ?	48 ± 8	52 ± ?	55 ± 16	.
ABLA/CARU, PAMY	246 ± 183	44 ± 7	46 ± ?	.	44 ± ?	.
ABLA/CARU, CARU	155 ± 27	57 ± ?	51 ± 7	.	50 ± 11	.
ABLA/BERE, BERE	206 ± 23	47 ± 4	46 ± 5	58 ± 7	46 ± 6	.
ABLA/JUCO	165 ± 44	35 ± ?	39 ± 15	28 ± ?	40 ± 15	.
ABLA/RIMO, RIMO	.	.	.	.	.	
ABLA/PERA	184 ± 34	37 ± 10	45 ± 9	47 ± 7	40 ± 13	.
ABLA/ARCO, PIEN	208 ± 53	.	36 ± ?	39 ± 10	36 ± 10	.
ABLA/ARCO, SHCA	134 ± 31	41 ± ?	37 ± 7	.	33 ± ?	.
ABLA/ARCO, ASMI	199 ± 41	.	36 ± 10	45 ± ?	40 ± ?	.
ABLA/ARCO, ARCO	238 ± 47	.	49 ± 13	54 ± ?	46 ± 8	.
ABLA/CARO	.	.	.	.	.	
PIAL/VASC	240 ± 73	.	21 ± ?	.	.	.
PIAL/CAGE	196 ± ?	.	.	.	.	.
PIAL/JUCO, SHCA	118 ± ?	.	36 ± 4	.	.	.
PIAL/JUCO, JUCO	143 ± 33	.	28 ± 5	.	.	.
PIAL/CARO, PICO	171 ± 29	.	30 ± 5	.	.	.
PIAL/CARO, CARO	253 ± ?	.	.	.	.	.
PIAL/FEID	150 ± ?	.	.	.	.	15 ± ?

APPENDIX E-2. ESTIMATED YIELD CAPABILITY OF EASTERN IDAHO-WESTERN WYOMING HABITAT TYPES BASED ON SITE INDEX DATA AND STOCKABILITY FACTORS



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APPENDIX F. EASTERN IDAHO-WESTERN WYOMING HABITAT TYPE FIELD FORM (FOR 3 PLOTS)

NAME

(CODE DESCRIPTION)

TOPOGRAPHY:	HORIZONTAL CONFIGURATION:	CANOPY COVERAGE CLASS:	
1-Ridge		0=Absent	3=25 to 50%
2-Upper slope	1-Convex (dry)	T=Rare to 1%	4=50 to 75%
3-Mid slope	2-Straight	1=1 to 5%	5=75 to 95%
4-Lower slope	3-Concave (wet)	2=5 to 25%	6=95 to 100%
5-Bench or flat	4-undulating	NOTE: Rate trees (>4" dbh) and regen, (0-4" dbh) separately (e.g., 4/2)	
6-Stream bottom			

DATE			
Plot No.			
Location			
T.R. S.			
Elevation			
Aspect			
Slope			
Topography			
Configuration			

	Scientific Name	Abbrev.	Common Name	Canopy Coverage Class		
TREES						
1.	Abies lasiocarpa	ABLA	subalpine fir	/	/	/
2.	Picea engelmannii	PIEN	Engelmann spruce	/	/	/
3.	Picea glauca	PIGL	white spruce	/	/	/
4.	Picea pungens	PIPU	blue spruce	/	/	/
5.	Pinus albicaulis	PIAL	whitebark pine	/	/	/
6.	Pinus contorta	PICO	lodgepole pine	/	/	/
7.	Pinus flexilis	PIFL	limber pine	/	/	/
8.	Pseudotsuga menziesii	PSME	Douglas-fir	/	/	/
9.	Populus tremuloides	POTR	quaking aspen	/	/	/
SHRUBS AND SUBSHRUBS						
1.	Acer glabrum	ACGL	mountain maple			
2.	Berberis repens	BERE	creeping Oregon grape			
3.	Cercocarpus ledifolius	CELE	curleaf mountain-mahogany			
4.	Juniperus communis	JUCO	common juniper			
5.	Ledum glandulosum	LEGL	Labrador tea			
6.	Linnaea borealis	LIBO	twinflower			
7.	Menziesia ferruginea	MEFE	menziesia			
8.	Pachistima myrsinites	PAMY	pachistima			
9.	Physocarpus malvaceus	PHMA	ninebark			
10.	Physocarpus monogynus	PHMO	mountain ninebark			
11.	Prunus virginiana	PRVI	chokecherry			
12.	Ribes cereum	RICE	squaw current			
13.	Ribes montigenum	RIMO	mountain gooseberry			
14.	Shepherdia canadensis	SHCA	russett buffalo-berry			
15.	Sorbus scopulina	SOSC	mountain ash			
16.	Spiraea betulifolia	SPBE	white spirea			
17.	Symphoricarpos albus	SYAL	common snowberry			
18.	Symphoricarpos oreophilus	SYOR	mountain snowberry			
19.	Vaccinium caespitosum	VACA	dwarf huckleberry			
20.	Vaccinium globulare (+ membranaceum)	VAGL	blue huckleberry			
21.	Vaccinium scoparium (+ myrtillus)	VASC	grouse whortleberry			
GRAMINOIDS						
1.	Agropyron spicatum	AGSP	bluebunch wheatgrass			
2.	Calamagrostis canadensis	CACA	bluejoint			
3.	Calamagrostis rubescens	CARU	pinegrass			
4.	Carex disperma	CADI	soft-leaved sedge			
5.	Carex geyeri	CAGE	elk sedge			
6.	Carex rossii	CARO	Ross sedge			
7.	Festuca idahoensis	FEID	Idaho fescue			
8.	Hesperochloa kingii	HEKI	spike fescue			
9.	Luzula hitchcockii	LUHI	smooth woodrush			
FORBS						
1.	Actaea rubra	ACRU	baneberry			
2.	Aconitum columbianum	ACCO	monkshood			
3.	Arnica cordifolia	ARCO	heartleaf arnica			
4.	Arnica latifolia	ARLA	mountain arnica			
5.	Astragalus miser	ASMI	weedy milkvetch			
6.	Caltha leptosepala	CALE	elkslip marshmarigold			
7.	Equisetum arvensis	EQAR	common horsetail			
8.	Galium triflorum	GATR	sweetscented bedstraw			
9.	Osmorhiza chilensis (+ depauperata)	OSCH	mountain sweetroot			
10.	Pedicularis racemosa	PERA	pedicularis			
11.	Senecio triangularis	SETR	arrowleaf groundsel			
12.	Streptopus amplexifolius	STAM	twisted stalk			
13.	Thalictrum occidentale	THOC	western meadowrue			
14.	Trollius laxus	TRLA	globe flower			
15.	Xerophyllum tenax	XETE	beargrass			
			SERIES			
			HABITAT TYPE			
			PHASE			

APPENDIX G. Glossary

The following terms are defined as used in this report. The definitions should minimize misunderstanding resulting from the fact that definitions may vary among specialists. Primary references include Hanson (1962), Ford-Robertson (1971), and Daubenmire (1968).

Abundant. When relating to plant coverage in the habitat type key, any species having a canopy coverage of 25 percent or more in a stand.

Accidental. A species that is found rarely or at most occasionally as scattered individuals in a given habitat type.

Association. A climax plant community; all climax stands consisting of essentially the same vegetational layers.

Basal area. The area of the cross-section of a tree trunk at 4.5 feet above the ground, usually expressed as the sum of tree basal areas in square feet per acre.

Bench, benchland. An area having flat or gently-sloping terrain (less than 15 percent slope), applied usually to the higher ground in a river valley.

Browse. (noun) Shrubby forage utilized especially by large animals. (verb) To eat shrubby forage.

Canopy coverage. The area covered by the gross outline of an individual plant's foliage, or collectively covered by all individuals of a species within a stand or sample plot. Canopy coverage is expressed as a percentage of the total area in the plot, or as a canopy coverage class (for example, class #1 = 1 to 5 percent coverage).

Classification. The orderly arrangement of objects according to their differences and similarities.

Climax community. The culminating stage in plant succession for a given environment that develops and perpetuates itself in the absence of disturbance.

Climax species. A species that is self-regenerating in the absence of disturbance with no evidence of replacement by other species.

Climax, types of ... in relation to environment (polyclimax concept).

Climatic climax. The climax vegetation that develops on "normal" soils (well-drained medium-textured) and gently sloping topography.

Edaphic climax. A variation in vegetation from the climatic climax caused by soils that differ from those of the climatic climax.

Topographic climax. A variation in vegetation from the climatic climax caused by topography that markedly influences microclimate.

Topo-edaphic climax. A variation in vegetation from the climatic climax caused by the combination of topographic and edaphic effects. (Example: *Pseudotsuga menziesii* stands occupying rocky north-slopes surrounded by nonforest habitat types.)

Common. When relating to plant coverage in the habitat type key, any species having a canopy coverage of 1 percent or more in a stand.

Community (plant community). An assembly of plants living together, denotes no particular ecological status. The basic unit of vegetation.

Community type. A classified plant community distinguished by various criteria, may be seral or climax.

Constancy. The percentage of stands in a habitat type that contain a given species. (Appendix C-1 uses "constancy classes" — "1" = 5 to 15 percent, "2" = 15 to 25 percent, etc.)

Cover type. A classified plant community distinguished by the existing dominant or codominant plant canopies.

Cryptogam. A collective term for a group of nonvascular plants, mainly mosses, lichens, liverworts and hornworts.

d.b.h. (diameter at breast height). Tree-trunk diameter measured at 4.5 feet (1.4 m) above the ground.

Depauperate. Describing an unusually sparse coverage of undergrowth vegetation. This condition often develops beneath a dense forest canopy, especially on sites having a deep layer of duff.

Disjunct. A segment of a population that is separated geographically from the main population.

Dominant. The species having the greatest canopy coverage; may refer to only the vegetational layer in which that species occurs or may refer to that layer plus others.

Ecologic amplitude. The range of environments occupied by a species, union, association, or series.

Ecosystem. Any community of organisms along with its environment, forming an interacting system.

Ecotone. The boundary or transition zone between adjacent plant communities, often delineating different habitat types and sometimes expressed as a hybrid stand.

Ecotype. A genetic race of a species adapted to a particular habitat.

Edaphic. Refers to soil.

Endemic. Indigenous to a particular local geographic area.

Forb. An herbaceous, usually broadleaved plant that is not a graminoid.

Forest cover type. A classified tree layer distinguished by the existing dominant or codominant trees.

Frequency. The percentage of quadrats (tiny plots) in a single sample stand that contain a given species, or more generally the degree of uniformity with which individuals of a species are distributed in a stand.

Graminoid. All grasses (Gramineae) and grasslike plants, including sedges (*Carex*) and rushes (*Juncus*).

Habitat type. An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Hybrid stand. A stand which displays the differential characteristics of more than one habitat type, often indicating an ecotone.

Identification. The placing of an individual object into its proper class according to some preestablished classification.

Indicator plant. A plant whose presence or abundance indicates certain environmental conditions—generally used in the classification of a habitat type or phase.

Mosaic. The pattern of different entities abutting each other.

'Natural' classification. A stratification derived from the clustering within a system according to all the traits of its individuals— generally applied to classifications that are based on natural relationships and serve a large number of purposes; however, no classification is truly natural since all are man made.

Phase. A subdivision of an association and a habitat type representing a characteristic variation in climax vegetation and environmental conditions, respectively.

Phenotype. A group of individuals distinguishable on the basis of morphological characteristics—in contrast to a "genotype" which is defined on the basis of genetic similarities.

Physiography. The study of the genesis and evolution of land forms.

Poorly represented. When relating to plant coverage in the habitat type key, any species that is absent or has a canopy coverage of less than 5 percent.

Riparian. Vegetation bordering watercourses, lakes, or swamps.

Scarce. When relating to plant coverage in the habitat type key, any species that is absent or has a canopy coverage of less than 1 percent.

Scree. Any slope covered with loose rock fragments. This includes accumulation of rock at the base of a cliff (talus) as well as loose material lying on slopes without cliffs.

Seral. A species or community that is replaced by another species or community as succession progresses.

Series. In forest site classification, a group of habitat types having the same climax dominant tree species. For example the *Pinus flexilis* series contains the *PIFL/HEKI, PIFL/FEID, PIFL/CELE*, and *PIFL/JUCO* h.t.'s.

Site index. An index of timberland productivity based upon the height of dominant or codominant trees at a certain reference age (usually 50 or 100 years).

Stand. An existing plant community that is relatively uniform in composition, structure, and habitat conditions; thus it may serve as a local example of a community type on a habitat type.

Stockability factor. An estimate of the stocking potential on a given site; for example a factor of 0.8 indicates that the site is capable of supporting only about 80 percent of "normal" stocking as indicated in yield tables.

Stocking. A general term for the number of trees (considering their size class) per acre.

Succession. The progressive changes in plant communities toward climax, with qualification, may refer to progressive changes in a direction other than climax.

Tolerance. The performance of a species in regard to particular environmental factors such as light or moisture, the extremes of which constitute its range of tolerance.

Union. A classified vegetational layer of an association that generally reappears in other associations, consisting of one or more species considered to have similar ecologic amplitudes within a given geographic area.

Well represented. When referring to plant coverage in the habitat type key, any species having a canopy coverage of greater than 5 percent.

Yield capability. The maximum mean annual increment attainable in a fully stocked natural stand, expressed in cubic feet per acre per year. (See a forest mensuration textbook for the distinction between "mean annual increment" and "periodic annual increment"; growth in a specific year, or period of years, is termed the latter.)

Zone. An area of land distinguished by the dominant climatic climax vegetation.

Steele, Robert; Cooper, Stephen V.; Ondov, David M.; Roberts, David W.; Pfister, Robert D. Forest habitat types of eastern Idaho-western Wyoming. Gen. Tech. Rep. INT-144. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 1983. 122 p.

A land-classification system based upon potential natural vegetation is presented for the forests of central Idaho. It is based on reconnaissance sampling of about 980 stands. A hierarchical taxonomic classification of forest sites was developed using the habitat type concept. A total of six climax series, 58 habitat types, and 24 additional phases of habitat types are defined and described. A diagnostic key is provided for field identification of the types based on indicator species used in development of the classification.

KEYWORDS: forest vegetation, Idaho, habitat types, plant communities, forest ecology, forest management, classification, Wyoming

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