MOUNTAIN GRASSLAND AND SHRUBLAND

HABITAT TYPES

OF

WESTERN MONTANA

(INTERIM REPORT - 1974)

by

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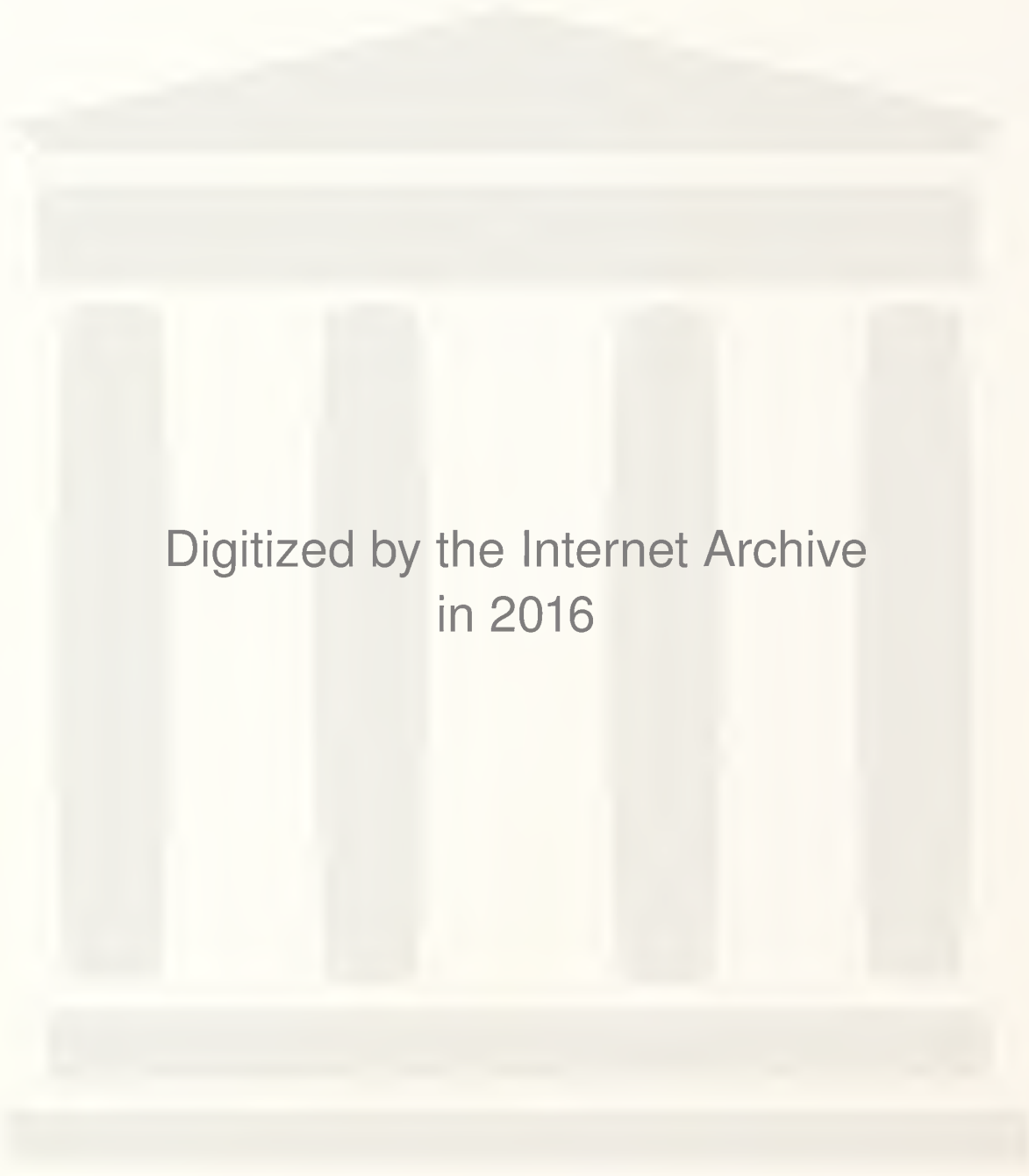

INTRODUCTION

The highly varied environment of the Northern Rocky Mountains creates a mosaic of forest, shrubland, and grassland vegetation. Species composition, productivity, and consequently resource potentials, differ greatly between and within these major vegetation types. The ability to classify land units within these complex vegetation types according to similarity in potentials and response to management is essential for multiple use planning and intensive resource management. Range managers are especially concerned with the site potentials and management requirements for the grasslands and shrublands.

Recognizing this need, Region One and the Intermountain Station began a joint effort in 1971 to develop a classification system for mountain grasslands and shrublands in western Montana. This classification was to be based on the habitat-type concept developed by R. Daubenmire, Washington State University. The natural vegetation growing on a site is viewed as an environmental integrator which reflects the biotic potentials of the site's environment. In recent years, this concept has been acknowledged by researchers and resource managers as a meaningful approach to wildland classification.

A progress report describing tentative habitat types in southwestern Montana was distributed in April 1973. Effort during the 1973 field season was concentrated in northwestern Montana to complete our coverage of western Montana. All data were then combined to develop the classification described herein. The classification first breaks the grassland and shrubland vegetation into series, which are then subdivided into habitat types. In some cases, the habitat types are further broken into phases. Series, habitat types, and phases can be identified in the field by use of a vegetation key. The classification and key are tentative pending verification of certain habitat types and field testing the vegetation key.

This work complements a similar cooperative effort between the Region and Station to develop a habitat-type classification for forested lands. These classifications should be useful for standardized mapping of Region One National Forest lands according to vegetation potential. They also provide the framework essential for organizing information on resource potentials, limitations, and responses to management in a sensible and useful manner.

Development of this classification is recognized as simply the first step in meeting the needs of the resource manager. We now must determine how much usable forage important habitat types can produce (as well as other resources, such as water), constraints on this use, and the management required to achieve maximum sustained use.

METHODS

Our approach to the development of this classification was conditioned by several somewhat controversial concepts: (1) no two plant communities are identical; (2) natural vegetation does not occur in discrete units, but rather as a continuum along complex environmental gradients; (3) land management based on discrete units is feasible, but is not feasible when based on the continuum concept; and (4) "relatively" similar plant communities should produce and respond similarly to management. The problem, then, becomes one of aligning sampled vegetation along a continuum of relative vegetation similarity and expected response to manipulation, and then partitioning this continuum into relatively homogeneous units that have reasonably similar biotic potentials and responses to management. Unavoidably, the actual division of a continuum into segments is often somewhat arbitrary.

Ideally, undisturbed communities of climax vegetation should be used for developing a classification based on biotic potential. However, the presence of domestic livestock in western Montana for over 100 years has left few such areas unchanged by grazing. This necessitated sampling both relatively pristine areas and areas subjected to grazing disturbance which, according to our judgment, had not been altered appreciably. In other words, a change in the relative amount of a species was acceptable, but not a pronounced alteration in species present. Severely altered communities were usually easily identified, but determination of degree of change at lesser levels of disturbance was very subjective unless undisturbed areas on similar sites were nearby for comparison.

Field crews were instructed to sample the following: all relic areas and exclosures, areas typical of large expanses of grasslands and shrublands not severely altered by grazing, areas typical of small recurring grasslands and shrublands, and distinct fence-line contrasts caused by differential grazing. The latter were sampled to provide data on composition changes attributable to grazing. Areas to be avoided, in addition to those severely overgrazed, included all obviously treated for brush control, those artificially seeded or irrigated, those crossing sharp ecotones, and those neither typical of large expanses or of smaller recurring sites.

A relatively uniform 20x20m macroplot was selected and permanently marked in each community (stand) intensively sampled. The macroplot was selected as typical of the area under consideration. Each macroplot was sampled by 40, 2x5dm microplots evenly distributed along two randomly selected transects crossing the macroplot. A list was prepared of species occurring on the macroplot, and canopy cover was estimated by species and vegetation classes on each microplot. Many ephemeral species were missed, however, because many areas were sampled after these species had dried and disintegrated. Estimates of litter, rock, and bare soil also were obtained. Photographs were taken, and the following environmental data recorded: elevation, aspect, percent slope, slope profile, position on slope, parent rock, origin of surface soil, soil depth, texture, and rockiness. A total of 355 such stands were sampled, 289 in the grassland series and 66 in the shrub series.

Plant species of uncertain identity were collected and returned to the laboratory for identification. A total of 494 different species representing over 200 genera were encountered. Nomenclature follows that of Hitchcock, et al,[1/] and Booth,[2/3/] with Hitchcock given preference. A collection of voucher specimens for this study is maintained at the Forestry Sciences Laboratory in Bozeman.

Field sheets were designed to facilitate direct transfer of data to punch cards. Following species verification, coding, and checking the field record for clarity, all data were punched onto cards for computer processing. A computer program was developed to summarize the stand data and to compute the following species parameters: absolute and relative frequency, absolute and relative canopy cover, and an importance value. Both paper and punch-card summaries were obtained. Stand summary data were then placed on magnetic tape to facilitate further computer analyses.

General reconnaissance data were obtained from an additional 255 stands to supplement the geographical coverage provided by the intensively sampled stands. These data consisted of general estimates of canopy cover by species on sites selected as representative of various conditions. A special effort was made to obtain information useful for evaluating successionary trends and to supply at least limited data on suspected habitat types not sampled otherwise.

A computer program was developed for computing similarity indices and ordinating stands on the basis of relative similarity. Used with Montana State University's Sigma-7, this program can compare at least 100 stands by 300 characteristics. An existing cluster analysis program with similar capabilities on the Sigma-7 and a program (SIMORD) permitting computation and direct computer plotting of ordination data were adjusted to our specific use.

Ordination of approximately 200 stands using, successively, species presence, relative canopy cover, and canopy cover scaled to different values assisted formulation of ideas on logical major groups of stands. Subsequent cluster analyses of these groups were of limited value for aligning stands into logical sequence. We believe that the relatively few species exerting a potentially dominant role as expressed by amount of canopy cover, morphology, or a combination of these factors, should be stressed in the development of a classification. The importance of these species appeared to be overshadowed in our ordination and cluster

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[1/] Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson. 1969. Vascular Plants of the Pacific Northwest, Parts 1 to 5. Univ. Wash. Press, Seattle and London.

[2/] Booth, W. E., and J. C. Wright. 1966. Flora of Montana, Part 2. Dept. Bot. and Microbiology, Montana State Univ., 305 pp. (Processed).

[3/] Booth, W. E. 1972. Grasses of Montana. Dept. Bot. and Microbiology, Montana State Univ., 64 pp. (Processed).

analysis by the great variation in presence and cover of the lesser species. The large variability of the many forb species especially appeared to overshadow basic similarities and dissimilarities inherent in the graminoid and shrub components which could be detected otherwise. Since we were dealing primarily with somewhat less than pristine conditions, species presence and composition within each stand had to be viewed rather flexibly and weight given to those species considered significant indicators of environmental differences. The forbs generally appeared more accidental on these areas than the graminoids and shrubs; in any event, most forbs appeared to be unreliable indicators of suspected environmental differences. Rather than intensively pursue the refinement of groupings obtained by using these numerical techniques, we decided to rely heavily upon the less sophisticated "association table" approach. Objective verification of the classification by variations of ordination and cluster analysis will be attempted in the near future.

The stands were first grouped into "series" determined by the primary climax dominant species. This determination was based upon judgment conditioned by the results of computer analysis and experience. Shrubs were generally considered first order, and graminoids second order dominants. No single forb species appeared to assume an overall dominant position in any of the communities sampled. A minimum canopy cover of approximately 5% combined with a frequency of 25 to 50%, depending upon the species growth habit, of a potentially dominant species was required to qualify a stand for a particular series. These minimum cover and frequency values were merely guides which were adjusted somewhat depending upon estimated grazing alteration.

Stands assigned to a series were placed in a "dynamic" association table which permitted horizontal alignment of stands and vertical alignment of species. The position of stands and species were adjusted until they were arranged into what appeared to be a sensible order along a continuum of vegetation similarity. Factors considered in selecting species upon which to base stand alignments included species dominance in the stands, suspected affinity to specific environmental conditions, and constancy of species within proposed groups. Partitioning of the continuum into "habitat types" followed. Usually one end of the series continuum differed obviously from the other, and usually this difference appeared to reflect a moisture gradient. Different species tended to occur at opposite ends of the continuum, but many others were so widely scattered that they appeared accidental; very likely this difference in species behavior reflects differences in overall ecological amplitude of the various species within the series. Actual separation of habitat types was based upon dominant and codominant species, reasonable consistency of the secondary species, and the likelihood of similar anticipated response to management. A "phase" was designated only when consistent dissimilarities of one or more secondary species suggested a real environmental difference, but one not sufficiently great to warrant separate habitat type status.

A dichotomous vegetation key was prepared to assist recognition of series, habitat types, and phases in the field. The key was tested for reliability by checking against the data for each of the intensively sampled and general reconnaissance stands. Summaries of cover classes by habitat types and phases are shown in Appendix A, and constancy and canopy cover of most plant species are shown in Appendix Tables B1 thru B14. Generally, only those species that either occur on 25% or more of the stands within a habitat type or phase, or those that have an average canopy cover of at least 1% are included in the summary tables. *Festuca scabrella, F. idahoensis,* and most of the *Carex* spp. are shown regardless of the amount present.

A considerable amount of data was collected during the study relating to the effects of grazing. Most was from sampling inside and outside of exclosures, and from other fence-line contrasts. These data were supplemented by literature review to provide comprehensive coverage of composition changes attributable to grazing for the different vegetation series. This information is included as a separate section in the report.

LIMITATIONS

The user of this guide to habitat types must bear in mind certain limitations created by unavoidable limitations in the study itself. As mentioned previously, development of such a classification ideally should be based on data only from areas of pristine vegetation; also, a large number of stands should be used for a data base. These conditions could only be partly met. Known areas of pristine vegetation were too few, thus requiring inclusion of communities of varied and poorly documented grazing history. Conceivably, grazing would greatly increase the variation in composition between stands which otherwise would be similar, which consequently would increase the uncertainty of breaking out probable habitat types. The foundation for the classification, therefore, is somewhat tenuous, and the classification is subject to possible changes as more information becomes available. This is particularly true for series and habitat types identified on the basis of relatively few stands.

A number of the western Montana habitat types are similar to those described by Daubenmire[4/] for the steppe region of eastern Washington. This similarity is somewhat superficial however, for it is created primarily by the same dominant and codominant species, which are the basis for the habitat-type names. Comparison of all species suggests that the Montana types are really distinct from those of Washington. A number of our species are associated with the Northern Great Plains flora which does not penetrate as far as eastern Washington. In like fashion, not all of the secondary species listed by Daubenmire occur in western Montana. Where duplication of habitat-type names with those of Daubenmire's was unavoidable, a suffix of (MONT) was added to the name to identify the habitat type as belonging to the Montana classification. This occured once in the grassland series and five times in the shrub series.

There are several changes in habitat types listed in this report from those shown in our 1973 progress report for southwestern Montana. Some changes are additions to account for new habitat types encountered in northwestern Montana. Others resulted from reevaluation and more inclusive data. The *Stipa comata* series has undergone the greatest change. We decided that the *S. comata/Sporobolis cryptandrus* and *S. comata/Carex filifolia* habitat types were not valid, and regrouped all stands into a *S. comata/Bouteloua gracilis* h.t. with an *Agropyron smithii-A. dasystachyum* phase. In the *Festuca scabrella* series, we changed the *F. scabrella/Stipa richardsonii* h.t. to phase status.

[4/] Daubenmire, R. 1970. Steppe Vegetation of Washington. Wash. Agr. Exp. Sta. Tech. Bull. 62, 131 pp.

Certain species were taxonomically difficult to separate under the highly varied developmental stages encountered in the field. Among these were certain species of *Lupinus*, *Astragalus*, the more infrequent *Poas*, and certain rhizomatous *Agropyrons*. The questionable taxonomic separation of *Festuca idahoensis* and *F. ovina* necessitated treating this complex as a single species, *F. idahoensis*. We are confident that most of our encounters were with *F. idahoensis*, but undoubtedly *F. ovina* was sometimes intermixed, particularly on subalpine sites. The possibly unfamiliar *Agropyron caninum* species is used by Hitchcock, et al (op. cit.) for a group including the more familiar, but taxonomically difficult, *A. trachycaulum* and *A. subsecundum*. We have adopted this usage to simplify field identification. Many of the early-drying ephemerals such as *Claytonia*, *Ranunculus*, *Dodecatheon*, and *Delphinium bicolor* are conspicuously absent from the species lists for the habitat types. These species were usually missed because much of our sampling occurred after they had dried and disintegrated; we simply did not have the resources to sample an area more than once.

The habitat types described in this report and the key for their identification are specific to the western portion of Montana (the area left of the dark line on fig. 1). The plains areas of the central and eastern part of the state were not covered. Applicability to adjoining mountainous areas in Wyoming, Idaho, and Canada has yet to be determined. The key in particular should be used with caution outside of the designated area. The key covers natural grassland and shrubland vegetation within the lower intermontane valleys and foothills on up through the subalpine type. The true alpine areas are not covered by this description.

The key applies only to vegetation <u>not severely altered</u> from pristine. Consequently, successful identification of a habitat type depends upon considerable discernment by the user in judging successional status and in making allowances for species likely to be altered appreciably by <u>abusive</u> grazing or other man-related treatments.

Figure 1.--The mountain grassland and shrubland habitat-type key applies specifically to that portion of Montana west of the dark line.

RESULTS

The results of this research are presented in the form of:

- Listings of mountain grassland and shrubland series, habitat types, and phases.
- Field keys for identification of these series, habitat types, and phases.
- Brief descriptive narratives for each habitat type.
- Appended tables showing species constancy and canopy cover for each habitat type.
- Brief listings and discussion of composition changes attributable to grazing.
- Appended tables of species canopy cover on paired, differentially-grazed stands.

General environmental characteristics suspected of being related to specific habitat types are mentioned in the narrative wherever possible; detailed environmental characterizations have yet to be developed. No information is available yet on forage potentials and management implications for these classification units.

MOUNTAIN GRASSLAND SERIES AND HABITAT TYPES

IN THE WESTERN HALF OF MONTANA (1974)

MOUNTAIN SHRUBLAND SERIES AND HABITAT TYPES
IN THE WESTERN HALF OF MONTANA (1974)

KEYS TO GRASSLANDS AND SHRUBLANDS IN THE WESTERN HALF OF MONTANA

Instructions

This key is designed to first lead to the appropriate SERIES, a broad category determined by the potentially climax dominant species, and then to the appropriate HABITAT TYPE. Following the series and habitat type designations in the key, parenthetical page numbers will lead the user to the next appropriate section of the key, or to a description of the habitat type. Unavoidably, relative amounts of species are sometimes used as separation criteria in the key. In most instances of questionable separation, the key will lead eventually to the same habitat type under either alternative. It is possible for a community to be identified correctly to a phase or habitat type, even though one of the species constituting the habitat type or phase name is absent. This occasionally happens because habitat types and phases are determined by the entire floral composition, and not by just the name species. The key is workable with a taxonomic knowledge of only 11 shrubs, 18 graminoids, and 6 forbs, most of which are common species readily identified by range technicians.

The user must remember that this key is designed for vegetation not severely altered from pristine conditions, and to make allowances for changes in community composition caused by abusive grazing or other man-related factors.

Key to Vegetation Series

1. Grassland or herbland aspect; nonsuffrutescent shrubs, if present, are as widely scattered individuals.

    2. *Festuca scabrella* usually abundant, with a minimum of 5% canopy cover.

        3. *Potentilla fruticosa* present as numerous, scattered, small plants often hidden by *F. scabrella*. (Compare with more disturbed areas to determine if *P. fruticosa* will increase appreciably.)
        POTENTILLA FRUTICOSA/FESTUCA SCABRELLA H.T. . . . . (p. 34)

        3. *P. fruticosa* absent or rare.
        FESTUCA SCABRELLA SERIES . . . . . (p. 15)

    2. *F. scabrella* absent or rare (may be occasional widely scattered plants with less than 5% canopy cover).

        4. *Festuca idahoensis* usually abundant; at least more than 5% canopy cover.
        FESTUCA IDAHOENSIS SERIES . . . . . (p. 16)

        4. *F. idahoensis* absent or rare (less than 5% canopy cover).

            5. *Agropyron spicatum* usually more than 10% canopy cover; may have somewhat less than 10% cover if *Bouteloua gracilis* has less than 20% canopy cover.
            AGROPYRON SPICATUM SERIES . . . . . (p. 14)

            5. *A. spicatum* absent or rare (less than 5% canopy cover).

                6. *Stipa comata* or *B. gracilis* dominant grasses; *Deschampsia caespitosa* absent (east of Continental Divide).
                STIPA COMATA/BOUTELOUA GRACILIS H.T. . . . . (p. 22)

                6. *S. comata* and *B. gracilis* absent; *D. caespitosa* present (subalpine or alpine environment).

                    7. *F. idahoensis* (or *F. ovina*) present.
                    FESTUCA IDAHOENSIS/DESCHAMPSIA CAESPITOSA H.T. . . . . (p. 27)

                    7. *F. idahoensis* (or *F. ovina*) absent.
                    DESCHAMPSIA CAESPITOSA/CAREX SPP. H.T. . . . . (p. 29)

1. Aspect of woody, nonsuffrutescent shrubs.

    8. Shrubby aspect caused by species of *Artemisia*.

        9. *Artemisia pedatifida* abundant.
        ARTEMISIA PEDATIFIDA/FESTUCA IDAHOENSIS H.T. . . . . (p. 34)

        9. *A. pedatifida* absent or rare.

10. *Artemisia arbuscula* with at least 5% canopy cover, even though *A. tridentata* may be more abundant.
ARTEMISIA ARBUSCULA SERIES . . . . . (p. 18)

10. *A. arbuscula* usually absent, but at most less than 5% canopy cover.

11. *Artemisia tripartita* present and usually the dominant shrub; *Artemisia tridentata* may also be abundant.
ARTEMISIA TRIPARTITA/FESTUCA IDAHOENSIS H.T. . . . . (p. 33)

11. *A. tripartita* absent; *A. tridentata* the dominant shrub.
ARTEMISIA TRIDENTATA SERIES . . . . . (p. 19)

8. Shrubby aspect created by shrubs other than *Artemisia; Artemisia* may be understory to taller shrubs.

12. *Purshia tridentata* abundant, usually the dominant shrub.
PURSHIA TRIDENTATA SERIES . . . . . (p. 21)

12. *P. tridentata* usually absent, or at least not a dominant shrub.

13. *Cercocarpus ledifolius* usually a dominant shrub, or codominant with *Rhus trilobata* or *Artemisia* spp.
CERCOCARPUS LEDIFOLIUS SERIES . . . . . (p. 36)

13. *C. ledifolius* absent.

14. *Potentilla fruticosa* abundant, or as scattered plants obscured by tall herbaceous layer, but with potential to increase in density.
POTENTILLA FRUTICOSA SERIES . . . . . (p. 20)

14. *P. fruticosa* absent.

15. *Rhus trilobata* abundant or present in large, scattered patches (well-drained uplands or hillsides).
RHUS TRILOBATA SERIES . . . . . (p. 37)

15. *Sarcobatus vermiculatus* abundant (poorly-drained, saline, or alkaline soils).
SARCOBATUS VERMICULATUS SERIES . . . . . (p. 38)

Key to *Agropyron spicatum* Habitat Types

1. *Bouteloua gracilis* usually with more than 5% canopy cover, or potentially able to increase (compare with areas more heavily grazed). Usually east of Continental Divide.

    2. *Liatris punctata* and *Carex filifolia* absent.
    AGROPYRON SPICATUM/BOUTELOUA GRACILIS H.T. . . . . (p. 23)

    2. Either *L. punctata* or *C. filifolia* present.
    AGSP/BOGR H.T., *LIATRIS PUNCTATA* PHASE . . . . . (p. 23)

1. *B. gracilis* absent or rare; potential to increase with overgraing minimal.

    3. Rhizomatous wheatgrasses and usually *Carex stenophylla* present; generally east of Continental Divide.

        4. *Stipa viridula* and *Vicia americana* absent.
        AGROPYRON SPICATUM/ AGROPYRON SMITHII - A. DASYSTACHYUM H.T.. (p. 23)

        4. *S. viridula* and usually *V. americana* present.
        AGSP/AGSM-AGDA H.T., *STIPA VIRIDULA* PHASE . . . . . (p. 23)

    3. Rhizomatous wheatgrasses absent.

        5. *Stipa comata* and/or *Stipa spartea* absent.
        AGROPYRON SPICATUM/POA SANDBERGII (MONT) H.T. . . . . (p. 24)

        5. *S. comata* and/or *S. spartea* present.
        AGSP/POSAN (MONT) H.T., *STIPA COMATA* PHASE . . . . . (p. 24)

Key to *Festuca scabrella* Habitat Types

1. *Stipa richardsonii* present.

    2. *Eriogonum umbellatum* present; *S. richardsonii* usually common.
    FESTUCA SCABRELLA/FESTUCA IDAHOENSIS H.T., *STIPA RICHARDSONII* PHASE. . (p. 25)

    2. *E. umbellatum* absent.

        3. *Agropyron spicatum* abundant (over 5% canopy cover); *Artemisia frigida* usually present.
        FESTUCA SCABRELLA/AGROPYRON SPICATUM H.T. . . . . (p. 25)

        3. *A. spicatum* absent or rare; *A. frigida* absent.
        FESC/FEID H.T., *STIPA RICHARDSONII* PHASE . . . . . (p. 25)

1. *S. richardsonii* absent.

    4. *Geranium viscosissimum* and *Potentilla gracilis* both present and usually conspicuous.
    FESTUCA SCABRELLA/FESTUCA IDAHOENSIS H.T., *GERANIUM VISCOSISSIMUM* PHASE(p. 25)

    4. Not as above.

        5. *Stipa comata, S. spartea,* or *Bouteloua gracilis* present.

            6. *Danthonia intermedia* present; *Gutierrezia sarothrae* absent.
            FESTUCA SCABRELLA/FESTUCA IDAHOENSIS H.T. . . . . (p. 25)

            6. *D. intermedia* absent; *G. sarothrae* usually present.
            FESC/AGSP H.T., *STIPA COMATA* PHASE. . . . . (p. 25)

        5. Neither *S. comata, S. spartea,* nor *B. gracilis* present.

            7. *Agropyron spicatum* abundant (at least 5% canopy cover, or about 1 plant/4 ft.^{2}); may be somewhat less abundant only if such species as *Danthonia intermedia, Stipa occidentalis,* and *Agropyron caninum* are absent.
            FESTUCA SCABRELLA/AGROPYRON SPICATUM H.T. . . . . (p. 25)

            7. *A. spicatum* not as above.
            FESTUCA SCABRELLA/FESTUCA IDAHOENSIS H.T. . . . . (p. 25)

Key to *Festuca idahoensis* Habitat Types

1. *Agropyron spicatum* abundant (more than 5% canopy cover); perennial *Bromus* spp. absent or extremely scarce (see alternative).

   2. *Stipa occidentalis* usually absent; if present, only in small amounts greatly exceeded by *Stipa comata*.
   FESTUCA IDAHOENSIS/AGROPYRON SPICATUM H.T. . . . . (p. 26)

   2. *S. occidentalis* conspicuous, and not exceeded by *S. comata*.
   FEID/AGSP H.T., *STIPA OCCIDENTALIS* PHASE . . . . . (p. 26)

1. *A. spicatum* either absent or a relatively minor species with less canopy cover than other *Agropyron* spp.; only abundant if perennial *Bromus* spp. prominent.

   3. *Artemisia frigida* present.

      4. *Agropyron smithii* and/or *A. dasystachyum* present.
      FESTUCA IDAHOENSIS/AGROPYRON SMITHII-A. DASYSTACHYUM H.T. . . . . (p. 26)

      4. *A. smithii* and *A. dasystachyum* absent.

         5. *Stipa occidentalis* absent.
         FESTUCA IDAHOENSIS/AGROPYRON SPICATUM H.T. . . . . (p. 26)

         5. *S. occidentalis* conspicuous.
         FEID/AGSP H.T., *STIPA OCCIDENTALIS* PHASE . . . . . (p. 26)

   3. *A. frigida* absent.

      6. *Deschampsia caespitosa* present; *Phleum alpinum* and *Trisetum* spp. also often present; *A. spicatum* absent.
      FESTUCA IDAHOENSIS/DESCHAMPSIA CAESPITOSA H.T. . . . . (p. 27)

      6. *D. caespitosa* absent; usually *P. alpinum* and *Trisetum* spp. also absent.

         7. *Carex filifolia* present, and both *Stipa occidentalis* and *Phlox hoodii* absent.
         FESTUCA IDAHOENSIS/CAREX FILIFOLIA H.T. . . . . (p. 26)

         7. *C. filifolia* usually absent; if present, must be accompanied by *S. occidentalis* or *P. hoodii*.

            8. *Stipa richardsonii* very abundant (more than 25% canopy cover).
            FESTUCA IDAHOENSIS/STIPA RICHARDSONII H.T. . . . . (p. 27)

            8. *S. richardsonii* usually absent; if present, less than 10% canopy cover.

               9. *Geranium viscosissimum* and/or *Potentilla gracilis* present.

10. Either *G. viscosissimum* or *P. gracilis* present, but not both.

FESTUCA IDAHOENSIS/AGROPYRON CANINUM H.T. . . . . (p. 27)

10. Both *G. viscosissimum* and *P. gracilis* present.

FEID/AGCA H.T., *GERANIUM VISCOSISSIMUM* PHASE . . . . . (p. 27)

9. Both *G. viscosissimum* and *P. gracilis* absent.

11. *Stipa occidentalis* absent.

12. *Agropyron smithii* and/or *A. dasystachyum* present.

FESTUCA IDAHOENSIS/AGROPYRON SMITHII-A. DASYSTACHYUM H.T. . . . . (p. 26)

12. Both *A. smithii* and *A. dasystachyum* absent.

FESTUCA IDAHOENSIS/AGROPYRON SPICATUM H.T. . . . . (p. 26)

11. *S. occidentalis* present.

FEID/AGSP H.T., *STIPA OCCIDENTALIS* PHASE . . . . . (p. 26)

Key to *Artemisia arbuscula* Habitat Types

1. *Festuca idahoensis* less than approximately 5% canopy cover.

    2. *Artemisia tridentata* present, *Stipa comata* absent.
    ARTEMISIA ARBUSCULA/AGROPYRON SPICATUM H.T. . . . . (p. 30)

    2. *S. comata* present, *A. tridentata* absent.
    ARAR/AGSP H.T., *STIPA COMATA* PHASE . . . . . (p. 30)

1. *F. idahoensis* greater than approximately 5% canopy cover.
    ARTEMISIA ARBUSCULA/FESTUCA IDAHOENSIS H.T. . . . . (p. 30)

Key to *Artemisia tridentata* Habitat Types

1. *Festuca idahoensis* absent.

    2. *Festuca scabrella* present.
        ARTEMISIA TRIDENTATA/FESTUCA SCABRELLA H.T. . . . . (p. 31)

    2. *F. scabrella* absent; *Agropyron spicatum* usually abundant.
        ARTEMISIA TRIDENTATA/AGROPYRON SPICATUM (MONT.) H.T. . . . . (p. 31)

1. *F. idahoensis* present, usually abundant.

    3. *Festuca scabrella* present, usually abundant.
        ARTEMISIA TRIDENTATA/FESTUCA SCABRELLA H.T. . . . . (p. 31)

    3. *F. scabrella* absent.

        4. *Geranium viscosissimum, Potentilla gracilis,* or *P. glandulosa,* and *Agropyron caninum* or *Bromus carinatus* present.
            ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS (MONT.) H.T., *GERANIUM VISCOSISSIMUM* PHASE . . . . . (p. 32)

        4. Not as above.
            ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS (MONT.) H.T. . . . . (p. 32)

Key to *Potentilla fruticosa* Habitat Types

1. *Festuca scabrella* canopy cover greater than approximately 10%.

    2. *Danthonia intermedia* and *Agropyron caninum* absent.
    POTENTILLA FRUTICOSA/FESTUCA SCABRELLA H.T. . . . . (p. 34)

    2. *D. intermedia* and *A. caninum* present.
    POFR/FESC H.T., *DANTHONIA INTERMEDIA* PHASE . . . . . (p. 34)

1. *F. scabrella* absent, or present only as scattered individuals with considerably less than 10% canopy cover.
    POTENTILLA FRUTICOSA/FESTUCA IDAHOENSIS H.T. . . . . (p. 34)

Key to *Purshia tridentata* Habitat Types

1. *Festuca idahoensis* present.

    2. *Festuca scabrella* present.
        PURSHIA TRIDENTATA/FESTUCA SCABRELLA H.T. . . . . (p. 35)

    2. *F. scabrella* absent.
        PURSHIA TRIDENTATA/FESTUCA IDAHOENSIS (MONT.) H.T. . . . . (p. 35)

1. *F. idahoensis* absent, *Agropyron spicatum* usually prominent in the understory.
    PURSHIA TRIDENTATA/AGROPYRON SPICATUM (MONT.) H.T. . . . . (p. 35)

DESCRIPTION OF HABITAT TYPES

Stipa comata Series

Stipa comata/Bouteloua gracilis h.t.

This habitat type is found east of the Continental Divide at elevations usually less than 5,000 ft., except in some of the higher mountain valleys of southwestern Montana and the foothill areas of southcentral Montana where it has been sampled at elevations up to 6,100 ft. *Bouteloua gracilis* is present in varying amounts, depending upon history of past use; it usually increases with overgrazing. *Stipa comata* and *B. gracilis* are the major forage producing species. When present, *Agropyron spicatum* occurs only as widely scattered plants. *Sphaeralcea coccinea* is the most constant forb. *Artemisia frigida, Gutierrezia sarothrae,* and *Opuntia polyacantha* are usually present and conspicuous.

A richer flora of graminoid and forb species is found on the deeper soils within this habitat type. The rhizomatous wheatgrasses, *Agropyron smithii* and *A. dasystachyum,* and usually *Carex filifolia* are important contributors to the forage production. *Koeleria cristata* and *Calamagrostis montanensis* are more consistently present along with such forb species as *Chrysopsis villosa, Gaura coccinea, Liatris punctata,* and *Phlox hoodii.* This variant has been delineated as the *A. smithii-A. dasystachyum* phase of the *S. comata/B. gracilis* h.t.

Data on ground cover by vegetation classes, litter, and bare soil are shown in Appendix A, and a list of species with constancy and average canopy cover values is given in Appendix Table B1.

Agropyron spicatum Series

Agropyron spicatum/Bouteloua gracilis h.t.

Whereas the *Stipa comata/Bouteloua gracilis* h.t. is usually found on gently undulating topography of broad valley bottoms, the *Agropyron spicatum/Bouteloua gracilis* h.t. occurs on steeper slopes off the valley bottoms and on toeslopes of the foothills. This habitat type, found at elevations under 6,000 ft. on dry, shallow, rocky soils, usually occurs east of the Continental Divide. *A. spicatum* generally shares dominance in canopy cover with *S. comata*. As in the *S. comata/B. gracilis* h.t., *B. gracilis* may be present in varying amounts, depending upon grazing history. Usually it is a conspicuous and important part of the flora with a potential to increase substantially under heavy grazing. *Phlox hoodii* and *Sphaeralcea coccinea* are the most constant and conspicuous forbs. *Artemisia frigida* is always present and conspicuous; *Gutierrezia sarothrae* and *Opuntia polyacantha*, which are also low-growing shrubby species, are usually present.

On the somewhat deeper, less stony soils of this habitat type, a richer flora is found which is characterized by the presence of either *Liatris punctata* or *Carex filifolia* and *Calamagrostis montanensis*. Other conspicuous forbs such as *Antennaria parvifolia* or *A. rosea*, *Chrysopsis villosa* and *Gaura coccinea* are also more consistently present. Areas of this nature have been delineated as a *L. punctata* phase of the *A. spicatum/B. gracilis* h.t.

Data on ground cover by vegetation classes, litter, and bare soil for the *A. spicatum* series are shown in Appendix A, and a list of species with constancy and average canopy cover values is given in Appendix Table B2.

Agropyron spicatum/Agropyron smithii-A. dasystachyum h.t.

This habitat type, usually found east of the Continental Divide, is represented by areas where *Agropyron smithii* and/or *A. dasystachyum* are present; if *Bouteloua gracilis* is present, it usually is not conspicuous and does not have the potential to increase substantially with heavy grazing. In some cases, *Poa cusickii* may be associated with or replace *Poa sandbergii*. *Gutierrezia sarothrae* and *Artemisia frigida* are the more constant low-growing shrubs. *Chrysopsis villosa*, *Phlox hoodii* and *Sphaeralcea coccinea* are the most constant and conspicuous broad-leaf species. Elevations range from 4,000 to 5,700 ft.

On the somewhat steeper slopes (17% vs. 6%), *Stipa viridula* averages 6% canopy cover, and *Vicea americana* usually is associated with the *S. viridula*. This variant has been delineated as the *S. viridula* phase of the *A. spicatum/A. smithii-A. dasystachyum* habitat type.

Agropyron spicatum/Poa sandbergii (Mont.) h.t.

Scattered throughout the western half of the state are areas on which *Agropyron spicatum* is the predominant species, but *Agropyron smithii* and *A. dasystachyum* are absent, and *Bouteloua gracilis* is either absent or inconspicuous. These areas are usually on steeper slopes (27% vs. 12%) than the previously described habitat types in the *A. spicatum* series. *Artemisia frigida* is the most consistent shrubby species. *Balsamhoriza sagittata,* a forb not present on previously described habitat types, is locally abundant in many communities of this type west of the Continental Divide. *Achillea millefolium, Chrysopsis villosa,* and *Comandra umbellata* are the most constant forbs throughout the habitat type. A *Stipa comata* phase has been delineated for the variant of this type that has either *S. comata* or *S. spartea* present.

Daubenmire has described an *A. spicatum/P. sandbergii* h.t. in Washington and indicates that these two species predominate, with only a wide scattering of a few other species. Our Montana habitat type contains a wider diversity of species, including *Koeleria cristata, Phlox hoodii,* and the previously noted *A. frigida, C. villosa,* and *C. umbellata* not mentioned by Daubenmire. Also, *S. comata* is very conspicuous in our *S. comata* phase; it averages 19% canopy cover (see Appendix Table B2).

Festuca scabrella Series

Festuca scabrella/Agropyron spicatum h.t.

This habitat type occurs on moderately deep soils (rooting depth averages 29 cm.) at elevations ranging from 2,900 to 6,100 ft; stands below 4,000 ft. elevation are generally west of the Continental Divide. *Agropyron spicatum* and *Festuca idahoensis* usually provide about equal canopy cover; however, *F. idahoensis* may be absent on some areas. A somewhat different species composition exists between communities in this type found east and west of the Divide. *Artemisia frigida, Chrysopsis villosa, Gutierrezia sarothrae, Stipa comata, Bouteloua gracilis, Muhlenbergia cuspidata, Liatris punctata,* and *Artemisia ludoviciana* are either more common or present only east of the Divide. Six out of seven of our stands lacking *F. idahoensis* were located east of the Divide. West of the Divide, species such as *Balsamhoriza sagitatta, Besseya wyomingensis, Castilleja lutescens,* and *Lomatium triternatum* are more common.

Those areas having either *S. comata, Stipa spartea,* or *B. gracilis* and *A. frigida* present have been designated as a *S. comata* phase of the *F. scabrella/A. spicatum* h.t. It is interesting to note that 19 of the 23 stands in this phase were east of the Continental Divide, and 19 of the 25 stands in the "main" habitat type were located west of the Divide.

Summary data on ground cover by vegetation classes, litter, and bare soil are shown in Appendix A, and a list of species, with constancy and average canopy cover values is given in Appendix Table B3.

Festuca scabrella/Festuca idahoensis h.t.

Elevations of this habitat type range from 2,800 to 7,000 ft. west of the Continental Divide and from 4,400 to 7,300 ft. east of the Divide. *Agropyron spicatum* and the shrubby species are less conspicuous in this type than in the *F. scabrella/A. spicatum* h.t.; in some communities they may be completely absent. Canopy cover of *F. scabrella* tends to increase, as does that of such graminoids as *Danthonia intermedia, Stipa occidentalis,* and species of *Carex.* The herbaceous layer and residues from previous years' growth almost completely cover the soil beneath the taller grasses. This habitat type has a greater cover of herbaceous species than does the *F. scabrella/A. spicatum* h.t.; such forbs as *Geum triflorum, Campanula rotundifolia,* and *Galium boreale* are more abundant.

A *Geranium viscosissimum* phase of the *F. scabrella/F. idahoensis* h.t. is delineated for areas where more favorable moisture conditions exist and *G. viscosissimum, Potentilla gracilis,* and usually *Eriogonum umbellatum* are present. Some of these moister sites also have *Stipa richardsonii* present, usually in very conspicuous amounts. A *S. richardsonii* phase of the *F. scabrella/F. idahoensis* h.t. has been designated for these areas. *Carex filifolia* is ordinarily abundant in this phase. In one of the communities sampled, the *F. scabrella* and *S. richardsonii* were so vigorous and dense (89% canopy cover) that *F. idahoensis* appeared unable to compete and was not present, although on an adjacent drier site it made up 25% of the canopy cover.

In northwestern Montana east of the Continental Divide, *Danthonia parryi* can be codominant with *F. scabrella.* The one community sampled is not appreciably different in species composition from the "main body" of stands except for the amount of *D. parryi* (59% canopy cover); therefore, a separate delineation was not considered. It is worth noting that *F. scabrella* was encountered east of the Continental Divide in abundance only north of a line running due east from Butte.

Festuca idahoensis Series

Festuca idahoensis/Agropyron smithii-A. dasystachyum h.t.

The *Festuca idahoensis/Agropyron smithii-A. dasystachyum* h.t. within the *F. idahoensis* series occurs primarily east of the Continental Divide in Montana. This habitat type is found at elevations ranging from 4,100 ft. to over 8,000 ft. It is differentiated from the *F. idahoensis/Agropyron spicatum* h.t. by the presence of the rhizomatous wheatgrasses and an absence or sparcity (less that 5% canopy cover) of *A. spicatum*. *Poa cusickii* is generally conspicuous and is associated with or replaces *Poa sandbergii*. Medium shrubs are scattered when present. *Artemisia frigida* is usually present and conspicuous. *Achillea millefolium, Gaillardia aristata,* and *Phlox hoodii* are the most prominent forbs.

Data on ground cover by vegetation classes, litter, rock, and bare soil are shown in Appendix A, and a list of species showing constancy and average canopy cover is given in Appendix Table B4 for this and other habitat types in the *F. idahoensis* series.

Festuca idahoensis/Agropyron spicatum h.t.

The *Festuca idahoensis/Agropyron spicatum* h.t. was the most frequent type encountered on mountain grasslands in southwestern Montana. *A. spicatum* is constantly present in this habitat type and more abundant than any rhizomatous wheatgrasses which may be present. This type occupies a wide elevational range, from 2,600 to 9,000 ft. The proportion of graminoids to forbs varies greatly; graminoid cover ranges from 25 to 90%, and forb cover ranges from 10 to 60%.

A *Stipa occidentalis* phase has been delineated for areas containing *S. occidentalis*; in this phase, *S. occidentalis* is always more frequent and abundant than *Stipa comata*. These areas apparently have more favorable moisture conditions for plant growth. *Agoseris glauca* and *Achillea millefolium* are constantly present in this phase, and *Agropyron caninum, Carex petasata, Campanula rotundifolia, Galium boreale, Gaillardia aristata,* and *Geum triflorum* are frequently present.

Festuca idahoensis/Carex filifolia h.t.

Although there were only four stands sampled in this habitat type, the absence of a dominant *Agropyron* and the constant association of *Carex filifolia, Danthonia intermedia, Geum triflorum,* and *Gentiana affinis* with *Festuca idahoensis* delineate this type from others in the *F. idahoensis* series. *Agropyron caninum* and *Carex petasata* are other constant graminoids; and *Achillea millefolium, Agoseris glauca, Antennaria rosea, Arenaria congesta, Cerastium arvense,* and *Polygonum bistortoides* are other constant forbs. Shrub cover is characteristically scarce. All stands in this habitat type are located at elevations above 7,500 ft. Two of the stands are on Bull Mountain northeast of Butte, and the other pair are in the Gravelly Range southeast of Dillon.

Festuca idahoensis/Stipa richardsonii h.t.

The predominance of *Stipa richardsonii* (33 to 41% canopy cover) associated with *Festuca idahoensis* and the absence of a constant and dominant *Agropyron* separate the *F. idahoensis/S. richardsonii* h.t. from others in the *F. idahoensis* series. *Danthonia intermedia, Stipa occidentalis,* and *Geranium viscosissimum* are species that are always present and abundant. A wide variety of other forb species is usually found with *Achillea millefolium, Chrysopsis villosa, Galium boreale,* and *Potentilla gracilis* being the more conspicuous of these.

Although only three stands were sampled within this habitat type, their widely scattered location supports the validity of its existence, even though it may be uncommon.

Festuca idahoensis/Agropyron caninum h.t.

This habitat type is primarily found in the higher mountain ranges of southwestern Montana at elevations between 6,500 and 8,700 ft; however, communities have also been sampled in both the Little Belt Mountains and Bridger Range. *Agropyron caninum* is consistently present and the dominant wheatgrass. In addition to *Festuca idahoensis, Danthonia intermedia* and *Stipa occidentalis* are generally present and fairly abundant. Forbs are abundant (from 35% to 70% canopy cover), with a number of species indicative of good moisture conditions. Shrubs are very scarce.

Some areas in this habitat type have *Geranium viscosissimum, Geum triflorum,* and *Potentilla gracilis* present in very conspicuous amounts; *Bromus anomalous* and/or *B. carinatus* and *Poa juncifolia* are also usually present. These areas, which appear to represent better environmental conditions, are delineated as a *G. viscosissimum* phase of the *F. idahoensis/A. caninum* h.t.

Festuca idahoensis/Deschampsia caespitosa h.t.

At higher elevations (7,700 to 10,200 ft.) in the *Festuca idahoensis* series, *Deschampsia caespitosa* is associated with *F. idahoensis*. These are the only species consistently present, although *Luzula spicata* is usually present. *F. idahoensis* is usually abundant, but at elevations of 10,000 ft. and above, it may be scarce. There is a complete absence of shrubby species. *Polygonum bistortoides, Potentilla diversifolia,* and *Trifolium* species are the most constantly associated forbs. Other forbs usually found include *Achillea millefolium* and *Lupinus argenteus.* These areas have been delineated as the *F. idahoensis/D. caespitosa* h.t. At the higher elevations in this type, *F. idahoensis* may be associated with or replaced by *Festuca ovina.*

Other Communities Within the *Festuca idahoensis* Series

As previously mentioned, some stands did not fit the classification, and insufficient data were available to justify separate habitat type designation. Two of these stands key to the *Festuca idahoensis* series.

One stand was a park located on the Lewis and Clark N.F. in the Moose Creek drainage at an elevation of 7,100 ft. *Stipa occidentalis* made up about 50% of the canopy cover, and *Festuca idahoensis* less than 5 percent. *Agoseris glauca* was the dominant forb, providing 25% of the cover. The site had moderate to heavy rodent disturbance.

The other stand represented an extensive area near East Pryor Mountain on the Custer N.F. at an elevation of 8,500 ft. The predominant species was *Carex scirpoidea*, constituting about 40% of the cover. *Festuca idahoensis* made up about 10% of the canopy cover. Twenty-seven different forb species were identified. The more abundant of these were *Phlox hoodii*, *Geum triflorum*, and *Zigadenus elegans*. Extensive sheep grazing in the past may have significantly altered the vegetation composition in this area and precludes its relationship with previously described habitat types in the *F. idahoensis* series.

Deschampsia caespitosa Series

Deschampsia caespitosa/Carex spp. h.t.

The *Deschampsia caespitosa/Carex* species h.t. is differentiated from the *Festuca idahoensis/D. caespitosa* h.t. by the absence of *Festuca.* Whereas the *F. idahoensis/D. caespitosa* h.t. generally occurs on steeper, better-drained slopes, the *D. caespitosa/Carex* spp. h.t. occurs on mountain valley bottoms and on areas that receive additional moisture from run-in and flooding. *D. caespitosa* is always present and abundant. No other species is consistently present; however, at least two grasslike species are always present, with the *Carex* genus being the most abundant. *Danthonia intermedia* and *Phleum alpinum* are usually present. *Antennaria corymbosa, Polygonum bistortoides,* and *Potentilla gracilis* are the most common forbs.

Elymus cinereus Series

Communities dominated by *Elymus cinereus* occur throughout western Montana, generally as small acreages on saline-alkaline soils of streambanks. However, in Lake County, approximately six miles west of Polson, *E. cinereus* is the dominant species on an extensive area of a broad valley. In this stand, *Agropyron smithii* and *Puccinellia distans* were the other more common graminoids. *Achillea millefolium* and *Lomatium* spp. were the most common forbs. A few widely scattered plants of *Chrysothamnus nauseosus* were also present.

Not enough information is available on this series to delineate habitat types with certainty. It is probable that *E. cinereus/A. smithii* may be a valid habitat type, and that an *E. cinereus/Distichlis stricta* h.t. may exist. Daubenmire has described an *E. cinereus/Distichlis* h.t. for Washington.

Artemisia arbuscula Series

Artemisia arbuscula/Agropyron spicatum h.t.

The *Artemisia arbuscula/Agropyron spicatum* h.t. is thought to be the driest of the shrubland types occurring in western Montana. These communities are found on dry, rocky soils at elevations ranging from 4,500 ft. to as high as 7,800 ft. *A. spicatum* is the dominant herbaceous species. *Koeleria cristata* and *Poa sandbergii* are other constantly present graminoids. *Festuca idahoensis* is always absent. *Opuntia polyacantha* is the most common low-growing shrub. Forb cover is relatively low (range 2-20%); *Linum perenne* and *Phlox hoodii* are usually present. On the heavier soils, *Artemisia tridentata* is associated with *A. arbuscula* and may actually be more abundant.

Stipa comata is present on sandier soils of this habitat type and *A. tridentata* is absent. Areas of this nature have been delineated as a *S. comata* phase. *Gutierrezia sarothrae* and *Artemisia frigida* are usually conspicuous species on this phase.

Data on ground cover by vegetation classes, litter, rock, and bare soil are shown in Appendix A, and a list of species showing constancy and average canopy cover is given in Appendix Table B6, for the *A. arbuscula* series.

Artemisia arbuscula/Festuca idahoensis h.t.

The *Artemisia arbuscula/Festuca idahoensis* h.t. differs from the *A. arbuscula/Agropyron spicatum* h.t. primarily because of the presence of conspicuous amounts of *F. idahoensis*. Originally, we thought the stand encountered at an elevation of 9,100 ft. at the head of Sheep Creek Basin southwest of Lima may have been a unique community. However, other communities have been located northwest of Gardiner on northfacing slopes at elevations of 6,200 ft. Communities of this type probably extend into Yellowstone National Park near the northeast entrance. Other communities of the *A. arbuscula/F. idahoensis* association have been described in central Idaho and in Teton County, Wyoming just south of the southern boundary of Yellowstone National Park.

Artemisia tridentata Series

Artemisia tridentata/Agropyron spicatum (Mont.) h.t.

The *Artemisia tridentata/Agropyron spicatum* (Mont.) h.t. represents the driest of the habitat types in the *A. tridentata* series. This habitat type is characterized by the abundance (33% canopy cover) of *A. spicatum* and the absence of both *Festuca idahoensis* and *F. scabrella*. *Bouteloua gracilis* and *Stipa comata* are usually present and conspicuous. Forbs are rather sparse, making up about 5% of the canopy cover. *Artemisia frigida* and *Gutierrezia sarothrae* are other shrubby species usually present.

In one questionable community of this habitat type, *Agropyron dasystachyum* made up 40% of the canopy cover and *A. spicatum* only about 3%. *Artemisia cana*, *Calamagrostis montanensis*, and *Stipa viridula*, three species not present on the other stands sampled, each made up 10% of the canopy cover. Data from this stand were not included in the summary tables shown in Appendix A and Appendix Table B7.

The *A. tridentata/A. spicatum* h.t. described by Daubenmire for eastern Washington differs considerably from that which occurs in western Montana. The low shrubs *A. frigida*, *Gutierrezia sarothrae*, and *Opuntia polyacantha* are usually conspicuous components of the Montana communities within this habitat type, as are the grasses *Koeleria cristata* and *B. gracilis*, but these species are lacking in the eastern Washington communities. Additional dissimilarities exist with the forbs. The only meaningful vegetation similarity is the dominance of *A. tridentata* and *A. spicatum*, and the importance of *S. comata* and *Poa sandbergii* in the vegetation of both regions.

Artemisia tridentata/Festuca scabrella h.t.

This habitat type is characterized by the association of *Festuca scabrella* with *Artemisia tridentata*. Both *Agropyron spicatum* and *Festuca idahoensis* are usually present, but not necessarily so; however, either one or the other is always present. Shrubby species other than *A. tridentata* are scarce. *Achillea millefolium* and *Antennaria rosea* are the most constant forbs. *Eriogonum umbellatum* and *Phlox hoodii* are other readily apparent forbs usually present. All stands in this type were located in the Little Belt Mountains at elevations ranging from 5,300 to 6,000 ft.

Artemisia tridentata/Festuca idahoensis (Mont.) h.t.

Festuca idahoensis is the dominant graminoid present in the *Artemisia tridentata/F. idahoensis* (Mont.) h.t; *Agropyron spicatum* is usually present and *Festuca scabrella* is absent. Certain areas on this habitat type have conspicuous amounts of *Agropyron caninum, Poa juncifolia, Geranium viscosissimum, Helianthella uniflora,* and *Potentilla gracilis.* These species appear to reflect more favorable environmental conditions. Areas of this nature have been delineated as a *G. viscosissimum* phase of the *A. tridentata/F. idahoensis* h.t. Certain other species, *Bromus carinatus, Danthonia intermedia, Stipa occidentalis, Eriogonum umbellatum,* and *Geum triflorum* are more constantly present and abundant on this phase. All communities in this habitat type are located in areas to the south of Bozeman. All stands in the phase are located on or near Cliff Lake Bench in southwestern Montana.

This habitat type appears to be considerably richer in perennial herbs in western Montana than where it occurs in eastern Washington, as described by Daubenmire. This is especially pronounced in our *Geranium viscosissimum* phase, which contains such grasses as *A. caninum, B. carinatus, D. intermedia, S. occidentalis, P. juncifolia,* and *Koeleria cristata,* and such forbs as *Campanula rotundifolia, G. triflorum, G. viscosissimum,* and *P. gracilis*, which are not listed for the type in Washington. In contrast, the Washington communities contain a much greater diversity of annual species than do our Montana communities.

Artemisia tripartita Series

Artemisia tripartita/Festuca idahoensis (Mont.) h.t.

In extreme southwestern Montana, there are areas where *Artemisia tripartita* is the dominant shrub. *Artemisia tridentata*, when present, is not abundant. *Chrysothamnus viscidiflorus, Artemisia frigida,* and *Tetradymia canescens* are usually present. The herbaceous layer is dominated by *Festuca idahoensis.* These areas have been delineated as the *A. tripartita/F. idahoensis* h.t. *Calamagrostis montanensis* and *Koeleria cristata* are consistently present. *Agropyron spicatum* or *Stipa comata* may be locally abundant. Forbs consistently present are *Achillea millefolium* and *Phlox hoodii.* This type is found at elevations of 6,600 to 7,600 ft.

The *A. tripartita/F. idahoensis* h.t. described by Daubenmire for Washington lacks a number of perennial plants that often contribute substantially to the type in western Montana. Among the more conspicuous of these species are: *Agropyron dasystachyum, C. montanensis, P. hoodii, Antennaria rosea,* and *Carex stenophylla.* On the other hand, *Carex filifolia* is often abundant in the Washington communities, but insignificant in the Montana version of this type. Annuals are also much more numerous in Washington than in Montana.

Artemisia pedatifida Series

Artemisia pedatifida/Festuca idahoensis h.t.

Artemisia pedatifida is an uncommon low, woody sagebrush that seldom exceeds 15 cm. in height. Booth indicates that this species has been collected in Gallatin and Carbon Counties. The only stands we observed are in Beaverhead County near Bannock Pass. *A. pedatifida* occurs on shallow, dry, alluvial soils with about a 10% slope, and at an elevation of approximately 7,000 ft. These stands are obviously distinct because of the low growth form of the sagebrush.

The observed stands are classified as an *A. pedatifida/Festuca idahoensis* h.t. because of the prevalence of *F. idahoensis* in the herbaceous layer. Other prominent grasses include *Poa sandbergii, Agropyron spicatum, Calamagrostis montanensis,* and *Agropyron dasystachyum.* The absence of any species of *Stipa* is particularly noteworthy. Forbs are relatively scarce and consist primarily of such mat-forming species as *Antennaria rosea* and *Phlox hoodii.*

Potentilla fruticosa Series

Potentilla fruticosa/Festuca scabrella h.t.

The *Potentilla fruticosa/Festuca scabrella* h.t. generally occurs on areas with gently sloping topography and relatively deep (31 cm. rooting depth) soils at elevations ranging from 4,300 to 5,800 ft. *P. fruticosa* may not be readily visible because of the taller herbaceous vegetation on some rangelands that have had a history of light to moderate grazing. However, with abusive grazing, *P. fruticosa* has the potential to increase substantially on these same areas. *F. scabrella* is the dominant herbaceous species present. A wide variety of forbs may be present, with *Achillea millefolium, Campanula rotundifolia, Gaillardia aristata,* and *Galium boreale* being the most consistent. On drier sites in this type, *Artemisia frigida, Gutierrezia sarothrae, Agropyron spicatum, Chrysopsis villosa,* and *Senecio canus* are usually a conspicuous part of the vegetation. Where more favorable moisture conditions exist, these species are absent or inconspicuous and *Danthonia intermedia, Agropyron caninum,* and usually *Potentilla gracilis* are important components of the herbaceous layer. A *D. intermedia* phase of the *P. fruticosa/F. scabrella* h.t. has been delineated for those areas showing more favorable moisture conditions.

Potentilla fruticosa/Festuca idahoensis h.t.

The *Potentilla fruticosa/Festuca idahoensis* h.t. occurs at higher elevations (6,500-8,400 ft.) than the *P. fruticosa/Festuca scabrella* h.t. Usually, *P. fruticosa* is the only shrubby species present. *F. idahoensis* and *Danthonia intermedia* are the dominant graminoids. When present, *Agropyron spicatum* and *F. scabrella* occur as widely scattered plants. *Besseya wyomingensis, Campanula rotundifolia,* and *Potentilla gracilis* are some of the forbs which are constantly present. Data on vegetative cover by classes, litter, rock, and bare ground are shown in Appendix A, and a list of species showing constancy and canopy cover is given in Appendix Table B10 for the *P. fruticosa* series.

Occasionally, patches of *P. fruticosa* are observed in wet meadows and along drainage patterns in the mountainous area. The similarity of these communities to those described above which occur on well-drained soils has not yet been determined. It is probable that the wet meadow communities differ sufficiently in composition, and certainly in environment, to be classed as a separate habitat type from those occurring on the well-drained sites.

Purshia tridentata Series

Purshia tridentata/Agropyron spicatum (Mont.) h.t.

The *Purshia tridentata/Agropyron spicatum* (Mont.) h.t. occupies rather extensive areas in the Bitterroot Valley, but throughout the remainder of the foothills area of western Montana it generally occurs in scattered, rather small (less than 20 acres) patches. Sites are on rather dry, rocky soils of the steeper slopes at elevations below 6,500 ft. *A. spicatum* is the dominant species in the herbaceous layer and *Balsamhoriza sagittata* is also very conspicuous. Both *Festuca idahoensis* and *F. scabrella* are absent. Data for the general reconnaissance and intensively sampled surveys of the *P. tridentata* series are shown in Appendix Table B11.

Daubenmire described a *P. tridentata/A. spicatum* h.t. for Washington and indicates it occurs only as scattered fragments. A number of species are common to both the Montana and Washington types, but a number of conspicuous differences in species composition also exist. The suffix (Mont.), therefore, is added to the type described for Montana. Most notable of the species differences are the presence of *Artemisia frigida* and *Chrysopsis villosa* in the Montana type and the absence of *Eriogonum* spp. which are common in the Washington type.

Purshia tridentata/Festuca scabrella h.t.

The *Purshia tridentata/Festuca scabrella* h.t. is differentiated from the *P. tridentata/Agropyron spicatum* (Mont.) h.t. by the presence of *F. scabrella*. *A. spicatum* is still the dominant species, but *F. scabrella* and *F. idahoensis* are conspicuous additions to the understory vegetation. *Achillea millefolium*, *Balsamhoriza sagittata*, and *Lithospermum ruderale* are the more conspicuous forbs usually present. The *P. tridentata/F. scabrella* h.t. occurs primarily as scattered, small patches on relatively steep (greater than 30%) slopes throughout the foothills of western Montana.

Although comparatively few acres are involved, the habitat types in the *P. tridentata* series are potentially important big-game winter ranges. The sites on which *P. tridentata* occurs as the dominant overstory species are generally located adjacent to and interspersed with Ponderosa pine and Douglas-fir forests having *P. tridentata* as an understory species.

Purshia tridentata/Festuca idahoensis (Mont.) h.t.

The *Purshia tridentata/Festuca idahoensis* (Mont.) h.t. is delineated from the *P. tridentata/Agropyron spicatum* (Mont.) h.t. by the presence of *F. idahoensis*, and from the *P. tridentata/Festuca scabrella* by the absence of *F. scabrella*. *A. spicatum* is still the dominant species in the herbaceous layer.

It is unknown how extensive the *P. tridentata/F. idahoensis* h.t. is in Montana. It has been observed northeast of Deerlodge as small (less than 20 acres), scattered patches on southerly exposed slopes at elevations above 5,000 ft. A *P. tridentata/F. idahoensis* association occurs in central Oregon, and Daubenmire describes a *P. tridentata/F. idahoensis* h.t. in Washington. Our Montana type has a somewhat different species composition than the Washington type; therefore, the suffix (Mont.) has been added to the Montana type name. *Artemisia frigida*, *Rosa* spp., *Stipa viridula*, *Chrysopsis villosa*, and *Phlox hoodii* are present in the Montana type, but not in the Washington type. On the other hand, *Balsamorhiza sagittata* is typically found in the Washington type, but is absent in the Montana type.

Cercocarpus ledifolius Series

Cercocarpus ledifolius/Agropyron spicatum h.t.

Stands found within the *Cercocarpus ledifolius/Agropyron spicatum* h.t. are similar in many ways to those in the *Purshia tridentata* series. They usually occur as rather small patches only a few acres in size; they are generally restricted to southerly and westerly exposures on rather dry, rocky soils; and yet they have the potential of being very important on big-game winter ranges. The identifying characteristic of the *C. ledifolius/A. spicatum* h.t. is the dominance of *Cercocarpus* which can reach heights in excess of 10 feet. In some instances, *Cercocarpus* forms dense thickets, but usually it occurs in rather open stands with a somewhat sparse herbaceous cover and considerable bare soil. *A. spicatum* is usually the dominant understory grass with *Oryzopsis hymenoides* and/or *Stipa comata* as other distinctive graminoid species.

Although only the *C. ledifolius/A. spicatum* h.t. has been recognized in Montana, other habitat types may exist. Communities with abundant *Festuca idahoensis* as an understory to *Cercocarpus* have been described in central Idaho, and a *C. ledifolius/A. spicatum/F. idahoensis* association has been noted in central Oregon. Along the Madison River, patches of *Rhus trilobata* are intermixed with *Cercocarpus*, and occasionally *Artemisia tridentata* occurs as a major understory species.

Rhus trilobata Series

Rhus trilobata/Agropyron spicatum h.t.

Rather small patches of *Rhus trilobata* occur occasionally on steeper slopes and along river breaks at elevations usually below 5,000 ft. These patches generally are less than 10 acres in size, and are distinct because of the dominant aspect of the *Rhus*. Such sites are usually rocky and fairly dry. The amount of *Rhus* may vary considerably, from only 1 or 2% cover to well over 25% cover. The understory vegetation is dominated by *Agropyron spicatum*. *Opuntia polyacantha* is present along with a scattering of one to several other shrubby species. Although canopy cover of forbs is low (6-11%), a wide variety of species may be present. The more conspicuous forbs are *Achillea millefolium*, *Chrysopsis villosa*, and *Sphaeralcea coccinea*. Areas having this combination of characteristics have been delineated as a *R. trilobata/A. spicatum* h.t.

Rhus trilobata/Festuca idahoensis h.t.

On one stand of *Rhus* located along the Smith River east of Hardy, *Festuca idahoensis* was present (6% canopy cover) as understory to the *Rhus*, along with several graminoid and forb species not present on other stands having a *Rhus* dominated aspect (see Appendix Table B13). More favorable moisture conditions apparently exist in certain areas that allow *F. idahoensis* to become established and competitive. A *R. trilobata/F. idahoensis* h.t. has been delineated for these areas.

Sarcobatus vermiculatus Series

Sarcobatus vermiculatus/Agropyron smithii h.t.

The *Sarcobatus vermiculatus/Agropyron smithii* h.t. occurs as narrow bands on floodplains along rivers and streams throughout the western half of the state, or as rather broad expanses along lakeshores and poorly drained intermittent watercourses primarily in northcentral Montana. Canopy cover of *Sarcobatus* may be low (less than 10%), but the stature of the plant compared to associated vegetation creates a shrubby aspect. *A. smithii* is the dominant understory species. *Atriplex nuttallii* is also present. Forb species are very sparse and there is a considerable amount of bare soil.

Sarcobatus vermiculatus/Elymus cinereus h.t.

The *Sarcobatus vermiculatus/Elymus cinereus* h.t. is delineated from the *S. vermiculatus/Agropyron smithii* h.t. by the presence of *E. cinereus*, although *A. smithii* is also abundant. As with the previous habitat type, forbs are scarce. The exact environmental differences that allow *E. cinereus* to exist are unknown. They may be related to amount of salinity and soil aeration due to length of time water remains on the area.

SPECIES COMPOSITION CHANGES ATTRIBUTED TO GRAZING

Three sources of information were used in an effort to develop information on the overall reaction of plant species to grazing influences: (1) intensively-sampled paired stands, (2) data from the general reconnaissance, and (3) literature review.

The intensively-sampled paired stands were deliberately selected to provide data comparing adjacent areas differentially grazed. Twenty such pairs were obtained; these consisted of inside-outside exclosure comparisons as well as fenceline contrasts under obviously different grazing intensities. A "t" test was used to determine whether differences between canopy cover means of a species were statistically valid or simply a result of sample variation. The paired-stand data are shown in Appendix Tables C1 to C4.

During the general reconnaissance phase of this study, we specifically sought information on composition changes attributable to grazing. This information consisted of qualitative judgements based on adjacent areas differentially grazed, on which species appeared to decrease or increase under grazing. The consistency of reaction to grazing was then summarized by habitat types.

Numerous publications relating to grassland and shrubland vegetation in the northern Rocky Mountains were scanned for information on composition changes caused by grazing. We attempted to fit this information into our habitat-type classification and evaluate it accordingly. Some published information was based on solid data; other was based primarily on visual comparison. Most studies were restricted to specific sites without attempting a comprehensive evaluation for a vegetation type as a whole; the general guides on decreaser, increaser, and invader species developed by the USFS and SCS are exceptions. It was impossible, however, to confidently relate these to our classification categories.

The most consistent finding from our comprehensive evaluation of the reaction of species to grazing was the lack of consistency in species response. Certain species, such as *Agropyron spicatum* and *Festuca scabrella*, were fairly consistent in response, but these were exceptions. The general lack of consistency is probably attributable to a combination of factors, such as the stage of vegetation deterioration, the class and intensity of livestock use, and the relative amount of the species available for grazing. It was not possible to analyze these factors separately. We only attempted to evaluate species response as related to series and habitat type.

We should point out several sources of error in interpreting impressions gained from visual comparisons of grazed and nongrazed areas, and from actual data on canopy cover. Low mat-forming species, such as *Phlox hoodii*, may appear to increase substantially with grazing simply because they no longer are hidden by taller vegetation; canopy cover comparisons, however, often show no difference in actual amounts. On the other hand, measuring canopy cover before and after grazing on the same area may show a decrease in a palatable species, which may not be real if the species is not adversely affected by partial removal of its canopy at the time of grazing; this possibility should be considered when comparing grazed areas with adjacent exclosures. One must also keep in mind that some species of relatively mediocre palatability may initially increase under abusive grazing only to later decrease when such abuse continues to the point where the more palatable plants no longer provide adequate forage.

The response of some species to grazing was considerably more erratic than that of others. Wherever possible, we placed a species in what appeared, overall, to be its most probable response category. Obviously, many of the species found within a series were not classified because neither our data nor the appropriate literature presented reasonably sound evidence of their response.

The listings of species response by vegetation series that follows is a generalization of the results from the three major sources of information described above. If a species appears to decline with grazing most of the time, it is listed as a "decreaser;" if it appears to increase most of the time, it is listed as an "increaser." Only exotic species that invade and increase with abuse are considered "invaders."

Stipa comata Series

Decreasers	Increasers	Invaders
Agropyron dasystachyum	*Artemisia frigida*	*Bromus tectorum*
Agropyron smithii	*Gutierrezia sarothrae*	*Melilotus officinalis*
Agropyron spicatum	*Opuntia polyacantha*	
Calamovilfa longifolia	*Bouteloua gracilis*	
Koeleria cristata	*Calamagrostis montanensis*	
Oryzopsis hymenoides	*Carex stenophylla*	
Stipa comata	*Poa sandbergii*	
Stipa viridula	*Antennaria dimorpha*	
	Chrysopsis villosa	
	Erigeron compositus	
	Sphaeralcea coccinea	

The response of *Carex filifolia* and *Phlox hoodii* were too variable to permit generalizations; they apparently increased substantially with grazing in some cases, and decreased in others. *Stipa comata* was occasionally mentioned in the literature as an increaser, but our evidence as a whole suggests that it decreases with grazing in this vegetation series.

Appendix Table C1 shows species canopy cover for two pairs of stands in which *S. comata* decreased significantly when grazed. Stand 102 is within the fenced, old Whitehall Cemetery on a slight westerly exposure at 4,600 ft. elevation, approximately 3 miles north of Whitehall. It has probably been protected from grazing for at least 30 years. Its companion, Stand 103, is immediately outside of the cemetery and receives what appears to be year-round use by horses and moderate use by cattle. Both areas were probably heavily grazed prior to fencing the cemetery. Stands 167 and 168 near Daisy Dean Creek, 6 miles east of Martinsdale, on a slight southwest exposure at 4,700 ft. elevation, represent the *Agropyron smithii-A. dasystachyum* phase of the STCO/BOGR h.t. Both stands have a probable history of heavy sheep grazing, but Stand 167, along a road right-of-way, is now subject to only occasional transient use. Stand 168 is in an adjacent pasture which is being at least moderately grazed by cattle.

Agropyron spicatum Series

Decreasers	Increasers	Invaders
Agropyron spicatum	*Artemisia frigida*	*Bromus tectorum*
Stipa viridula	*Artemisia tridentata*	*Centaurea maculosa*
Liatris punctata	*Chrysothamnus nauseosus*	*Cirsium vulgare*
Lygodesmia juncea	*Chrysothamnus viscidiflorus*	*Taraxicum officinale*
Oxytropis riparia	*Gutierrezia sarothrae*	*Tragopogon dubius*
Potentilla pensylvanica	*Bouteloua gracilis*	
	Carex stenophylla	
	Helictotrichon hookeri	
	Poa sandbergii	
	Sporobolus cryptandrus	
	Antennaria dimorpha	
	Chrysopsis villosa	
	Erigeron filifolius	
	Galium boreale	
	Grindelia squarrosa	
	Hymenoxys acaulis	
	Lesquerella alpina	
	Lupinus sericeus	
	Paronychia sessilifolia	
	Sphaeralcea coccinea	

A number of species appeared to increase in some instances and decrease in others. The most pronounced of these were *Stipa comata, Agropyron smithii, A. dasystachyum, Koeleria cristata,* and *Phlox hoodii.* The conditions related to these different reactions to grazing are not known.

Both *Artemisia frigida* and *Bouteloua gracilis* usually increased with grazing, but not invariably so, as shown in Appendix Table C2. Paired stands 194 and 195 are at the Oka Coulee Water Catchment Exclosure, 5 miles northwest of Judith Gap, on a 15% west exposure at 5,100 ft. elevation. The canopy cover of *A. frigida* is significantly greater in Stand 194, which is inside of the exclosure and protected from grazing for about 10 years, than in Stand 195 which is outside and grazed by cattle. Both areas were probably grazed heavily by sheep in the past. Stands 12 and 13 are on the Red Bluff Ranch, 2 miles east of Norris, on a 5% west exposure at 5,000 ft. elevation. Canopy cover of *B. gracilis* is significantly greater on Stand 13, moderately grazed by cattle and horses, than on immediately adjacent Stand 12 which is heavily grazed by cattle and horses; this area was also very likely heavily grazed by sheep before about 1950.

Canopy cover for two other pairs of stands within the *Agropyron spicatum* series are shown in Appendix Table C2. Stands 107 and 108 are near the Quinn Creek Church, 10 miles southeast of Boulder, on a slight northeast exposure at 4,600 ft. elevation. Stand 107, within the old church driveway, has received negligible use for an undetermined number of years, whereas Stand 108 is currently used by both cattle and horses. Stands 16 and 17 are at the old Rochester Cemetery, 20 miles west of Twin Bridges, on a 10% easterly exposure at 5,800 ft. elevation. Stand 16 is within the cemetery exclosure and probably has not been grazed appreciably for the past 70 years. Stand 17, just outside of the fence, is currently used by cattle and no doubt was heavily grazed by sheep, horses, and cattle in the past.

Festuca scabrella Series

Decreasers	Increasers	Invaders
Agropyron caninum	*Artemisia frigida*	*Bromus tectorum*
Agropyron dasystachyum	*Artemisia tridentata*	*Poa pratensis*
Carex vallicola	*Chrysothamnus nauseosus*	*Centaurea maculosa*
Festuca scabrella	*Gutierrezia sarothrae*	*Cirsium vulgare*
Stipa richardsonii	*Juniperus horizontalis*	*Taraxicum officinale*
Erigeron subtrinervis	*Potentilla fruticosa*	*Tragopogon dubius*
Eriogonum umbellatum	*Bouteloua gracilis*	
Liatris punctata	*Carex filifolia*	
Oxytropis lambertii	*Carex pennsylvanica*	
Phlox longifolia	*Danthonia intermedia*	
Potentilla gracilis	*Danthonia parryi*	
Danthonia unispicata	*Anemone patens*	
Festuca idahoensis	*Antennaria dimorpha*	
Helictotrichon hookeri	*Antennaria rosea*	
Juncus balticus	*Antennaria umbrinella*	
Koeleria cristata	*Arenaria congestis*	
Muhlenbergia cuspidata	*Arnica fulgens*	
Poa sandbergii	*Artemisia ludoviciana*	
Stipa comata	*Aster campestris*	
Stipa occidentalis	*Aster falcatus*	
Stipa spartea	*Astragalus miser*	
	Balsamorhiza sagittata	
	Cerastium arvense	
	Chrysopsis villosa	
	Comandra umbellata	
	Erigeron compositus	
	Gaura coccinea	
	Geranium viscosissimum	
	Geum triflorum	
	Huechera spp.	
	Phlox albomarginata	
	Phlox hoodii	
	Sphaeralcea coccinea	
	Solidago missouriensis	
	Vicia americana	

Conspicuous differences in canopy cover between lightly and heavily grazed stands were apparent for several important species within the *Festuca scabrella* series, yet these differences lacked consistency. *Agropyron spicatum* apparently both increased and decreased significantly on paired stands within this series (Appendix Table C3) irrespective of habitat type. The literature supports these findings; *A. spicatum* was shown as a decreaser in four references and as an increaser in three references for studies subsequently identified as related to the *F. scabrella* series. The same sort of variability in reaction to grazing in this series can be ascribed to *Festuca idahoensis*, which was shown to be an increaser from five literature references, and a decreaser from two. Our data suggest that *F. idahoensis* increases with grazing in the FESC/FEID h.t. and decreases in the FESC/AGSP h.t. The status of *Achillea millefolium* was unclear from our data, since it was found to have both increased and decreased significantly; however, the literature strongly suggests that it should be considered an increaser.

Antennaria rosea, *Chrysopsis villosa*, and *Geum triflorum* are all considered definitely to increase under heavy grazing. Nevertheless, exceptions occurred even with these species in our paired-stand comparisons.

Canopy cover data for the differentially grazed paired stands within the *F. scabrella* series can be found in Appendix Table C3. The location of and grazing on these stands are as follows:

Stands 232 and 233 - Near Bowman's Corner, 20 miles southeast of Augusta, on an 8% north exposure at an elevation of 4,700 ft. Stand 232 is along the highway right-of-way with no current livestock grazing. Stand 233 is in an adjacent pasture which receives moderate to heavy cattle use.

Stands 87 and 88 - Along the Mullan Gulch road, approximately 7 miles northwest of Deerlodge, on a 10% southwest exposure at 5,200 ft. elevation. Stand 87 is along the road right-of-way which receives only transient cattle grazing. Stand 88 is in an adjacent pasture moderately grazed by cattle. Elk and deer use both stands.

Stands 366 and 367 - Near the entrance of the Sun River Game Range, 17 miles northwest of Augusta, on a 4% north exposure at 4,800 ft. elevation. Stand 366 has been virtually protected for about 25 years, having received only light horse use. Stand 367 is in an adjacent pasture heavily used by cattle.

Stands 330 and 331 - On Square Butte, about 7 miles southwest of Sun River, on a 3% west exposure at 4,300 ft. elevation. Stand 330 is within an exclosure constructed about 1960; it received only incidental use before then because of lack of water. Stand 331 is just outside of the exclosure and has been grazed by cattle for about 12 years.

Stands 337 and 338 - A fenceline comparison along Willow Creek, 16 miles northeast of Sunburst, on a 7% southwest exposure at 4,200 ft. elevation. Stand 337 is on an area slightly grazed by cattle and sheep; Stand 338 is in an adjacent pasture heavily grazed by cattle.

Stands 198 and 199 - The Flagstaff Exclosure, 16 miles southeast of White Sulphur Springs, on a 3% east exposure at an elevation of 5,700 ft. Stand 198 is inside the exclosure (established 1950) and, except for some elk and deer use, not grazed for 23 years. Stand 199 is immediately outside the exclosure on moderately grazed cattle range.

Stands 37 and 38 - The Eagle Basin Exclosure, about 10 miles west of Townsend, on a 25% southern exposure at 7,000 ft. elevation. Stand 37 is inside the exclosure, fenced in 1934. Stand 38 is immediately adjacent to the exclosure on moderately used cattle range.

Stands 241 and 242 - The Gibbons Road Exclosure, 5 miles southeast of Sula, on a 33% west exposure at 6,000 ft. elevation. Stand 241 is within the exclosure established in 1958 and thus protected from grazing for 15 years. Stand 242 is next to the exclosure and grazed moderately to heavily by cattle. This area was part of a sheep allotment in the 1930's.

Festuca idahoensis Series

Decreasers	Increasers	Invaders
Agropyron caninum	*Artemisia frigida*	*Bromus tectorum*
Agropyron spicatum	*Chrysothamnus nauseosus*	*Poa pratensis*
Bromus marginatus	*Gutierrezia sarothrae*	*Centaurea maculosa*
Festuca idahoensis	*Carex petasata*	*Cirsium vulgare*
Hesperochloa kingii	*Carex stenophylla*	*Taraxicum officinale*
Poa ampla	*Danthonia intermedia*	*Tragopogon dubius*
Poa interior	*Danthonia unispicata*	
Stipa viridula	*Helictotrichon hookeri*	
Agoseris glauca	*Koeleria cristata*	
Aster integrifolius	*Poa cusickii*	
Crepis spp.	*Poa sandbergii*	
Erigeron caespitosus	*Stipa comata*	
Geranium viscosissimum	*Stipa lettermanii*	
Lupinus spp.	*Stipa occidentalis*	
Potentilla gracilis	*Achillea millefolium*	
Vicia americana	*Arnica fulgens*	
	Campanula rotundifolia	
	Cerastium arvense	
	Chrysopsis villosa	
	Erigeron compositus	
	Erigeron filifolius	
	Gaura coccinea	
	Geum triflorum	
	Hymenoxys acaulis	
	Pedicularis contorta	
	Phlox hoodii	
	Polygonum bistortoides	
	Potentilla diversifolia	
	Solidago missouriensis	

Our total evidence for *Stipa occidentalis, Koeleria cristata, Achillea millefolium,* and *Cerastium arvense* suggests that these species are increasers within the *Festuca idahoensis* series, even though our paired-stand data (Appendix Table C4) show that in one out of six comparisons they were significantly less abundant on the grazed area. Both *Chrysothamnus viscidiflorus* and *Tetradymia canescens* decreased significantly on the grazed member of paired Stands 112 and 113, but this was attributed to elk and deer winter browsing; we found no evidence indicating that these two species either increase or decrease because of livestock grazing. The literature suggests that *Carex obtusata, Antennaria rosea, Astragalus miser,* and *Phlox multiflora* be considered increasers in this series, but our data indicate the opposite; therefore, we did not assign these four species to either category. The response of *Agropyron dasystachyum* and *Artemisia ludoviciana* was also too variable overall to permit categorization. *Festuca idahoensis* and *Lupinus* spp. are unquestionably decreasers in this series, although they may also increase in some cases.

Canopy cover data for the six pairs of differentially grazed stands within the *F. idahoensis* series can be found in Appendix Table C4. The location and history of these stands follows:

Stands 163 and 164 - The Flat Iron Ridge Exclosure, 3 miles southeast of White Sulphur Springs, on a 2% north exposure at 5,800 ft. elevation. Stand 163 is within the exclosure constructed in 1953. The area was probably heavily grazed by sheep in the past, but has received only light deer and trespass cattle grazing for the past 20 years. Stand 164 is next to the exclosure on moderately grazed cattle range.

Stands 105 and 106 - The Hadley Park Exclosure, 9 miles south of Boulder, on a 15% westerly exposure at an elevation of 5,800 ft. Stand 105 is inside of the exclosure and protected from grazing by livestock since 1963. Although this area also was probably used fairly heavily by sheep in the past, it is currently used only by elk and deer. Stand 106 is immediately outside of the exclosure on moderately grazed cattle range.

Stands 112 and 113 - The Wall Creek Exclosure, approximately 25 miles south of Ennis, on a 12% east exposure at an elevation of 6,200 ft. Stand 113 is inside of an exclosure, built in 1964, which excludes both livestock and big game. Stand 112 is on adjacent range currently used moderately by cattle in the summer and elk and deer in the winter.

Stands 200 and 201 - The Hatfield Mountain Exclosure, 16 miles northwest of Wilsall, on a 14% south exposure at 7,000 ft. elevation. Stand 200 has been protected from grazing for 11 years. Stand 201 is outside of the exclosure on moderately to heavily used cattle range.

Stands 176 and 177 - A fenceline contrast near Spotts Gulch, 13 miles south of Big Timber, on a 27% northwest exposure at 5,700 ft. elevation. Stand 176 currently receives light cattle grazing, some deer use, and is moderately disturbed by rodents. Stand 177 receives moderate to heavy cattle use and some deer use.

Stands 43 and 44 - The Cliff Lake Natural Area, approximately 40 miles south of Ennis, on a 3% west exposure at 7,100 ft. elevation. Stand 44 is within the natural area which was fenced in 1951; this area had been grazed only lightly by sheep before then. Stand 43 is on adjacent range that has been moderately grazed by cattle for the past 21 years, and only lightly grazed by sheep before then.

Shrub Series in General

Very little direct information is available regarding the grazing response of plants within the various shrub series. In most cases, these series are fairly similar floristically to one or more major grassland series, except for the dominance of a shrub. An insight to species reaction to grazing within a particular shrub series might be gained by looking at its grassland series counterparts. We have no reason to believe that the major species will respond differently to grazing in comparable shrubland and grassland series.

Undoubtedly *Artemisia tridentata* increases with livestock grazing within the *A. tridentata* series; it is an unpalatable, dominant shrub. Other major species within the ARTR/AGSP h.t. will probably respond similarly to those in the *Agropyron spicatum* series, whereas those in the ARTR/FESC h.t. will likely respond in the same manner as those in the *Festuca scabrella* series. The major species in the ARTR/FEID h.t. will probably behave as they do in the *Festuca idahoensis* series.

The same rationale applies to the other shrub series. *Artemisia arbuscula, Artemisia tripartita, Rhus trilobata,* and *Potentilla fruticosa* are all dominant shrubs that are largely unpalatable to livestock and will probably increase with abusive grazing. *Purshia tridentata* and *Cercocarpus ledifolius*, on the other hand, are dominating shrubs palatable to both livestock and game. The reaction of these latter two shrubs to livestock grazing depends on intensity of use.

Other major plant species within the RHTR/AGSP, PUTR/AGSP, and CELE/AGSP habitat types will probably react to livestock grazing as they do in the *Agropyron spicatum* series, but those in the dry ARAR/AGSP h.t. will probably behave as in the *Stipa comata* series. Species within the ARAR/FEID, ARTRI/FEID, RHTR/FEID, POFR/FEID, and PUTR/FEID habitat types will likely respond as in the *Festuca idahoensis* series. Species within the POFR/FESC and PUTR/FESC habitat types will probably react to grazing as they do in the *Festuca scabrella* series.

APPENDICES

APPENDIX A. COVER CLASS SUMMARIES BY HABITAT TYPES

(Mean and range of ground cover, and number of species identified on 20x20m sample areas; number of stands sampled in each h.t. are shown in parentheses following the h.t. name.)

HABITAT TYPE	CANOPY COVER			BRYO-PHYTES	LITTER	ROCK	BARE SOIL	NUMBER of SPECIES
	Shrubs	Grass	Forbs					
	(Percent Ground Cover)							(No.)
STIPA COMATA/BOUTELOUA GRACILIS (7)								
Mean	5	54	1	10	23	5	24	16
Range	0-13	27-65	<1-3	5-16	3-63	1-10	12-34	8-32
STCO/BOGR, *AGROPYRON SMITHII-A. DASYSTACHYUM* Phase (18)								
Mean	6	66	11	15	53	4	9	25
Range	<1-20	35-90	2-44	<1-48	11-86	0-25	2-19	11-42
AGROPYRON SPICATUM/BOUTELOUA GRACILIS (9)								
Mean	11	36	3	12	19	17	17	20
Range	4-17	24-45	0-11	4-26	12-26	2-46	4-42	11-28
AGSP/BOGR, *LIATRIS PUNCTATA* Phase (16)								
Mean	6	59	15	16	54	6	6	30
Range	<1-15	34-76	5-27	<1-53	15-86	<1-18	<1-21	19-38
AGROPYRON SPICATUM/AGROPYRON SMITHII-A. DASYSTACHYUM (9)								
Mean	5	42	20	15	36	13	18	30
Range	0-13	27-56	4-66	2-73	17-68	<1-70	<1-32	17-42
AGSP/AGSM-AGDA, *STIPA VIRIDULA* Phase (7)								
Mean	8	49	24	9	44	17	9	35
Range	0-23	27-76	12-34	<1-14	18-82	1-63	1-23	28-44
AGROPYRON SPICATUM/POA SANDBERGII (MONT.) (8)								
Mean	6	58	17	24	53	23	13	26
Range	0-24	42-69	3-31	<1-63	38-64	3-59	1-30	17-39
AGSP/POSAN (MONT.), *STIPA COMATA* Phase (9)								
Mean	6	52	19	17	47	11	12	30
Range	<1-13	24-72	<1-44	1-59	14-81	<1-56	0-22	17-44
FESTUCA SCABRELLA/AGROPYRON SPICATUM (25)								
Mean	2	67	28	21	62	5	5	35
Range	0-20	27-90	12-47	2-63	14-90	<1-23	0-24	20-52
FESC/AGSP, *STIPA COMATA* Phase (23)								
Mean	7	65	22	14	65	6	5	36
Range	<1-57	39-94	7-40	<1-57	12-92	0-19	0-15	27-48
FESTUCA SCABRELLA/FESTUCA IDAHOENSIS (19)								
Mean	1	78	28	16	70	1	1	33
Range	0-8	48-92	9-64	0-67	17-95	0-8	0-3	16-44
FESC/FEID, *GERANIUM VISCOSISSIMUM* Phase (12)								
Mean	2	73	46	22	68	3	2	40
Range	0-25	38-90	18-68	0-91	29-87	0-22	0-7	31-63

APPENDIX A. - Page 2

HABITAT TYPE	CANOPY COVER			BRYO-PHYTES	LITTER	ROCK	BARE SOIL	NUMBER of SPECIES
	Shrubs	Grass	Forbs					
	(Percent Ground Cover)							(No.)
FESC/FEID, *STIPA RICHARDSONII* Phase (15)								
Mean	2	87	32	12	78	<1	1	32
Range	0-14	69-95	6-69	<1-38	30-97	0-1	0-3	16-50
FESTUCA IDAHOENSIS/AGROPYRON SMITHII-A. DASYSTACHYUM (10)								
Mean	3	67	33	14	64	5	3	27
Range	0-10	48-83	1-67	4-28	14-90	<1-18	<1-8	15-42
FESTUCA IDAHOENSIS/AGROPYRON SPICATUM (46)								
Mean	3	62	28	15	45	8	5	33
Range	0-15	25-86	10-55	<1-62	9-94	0-40	0-25	22-50
FEID/AGSP, *STIPA OCCIDENTALIS* Phase (15)								
Mean	1	69	48	8	55	5	2	38
Range	0-6	42-90	32-63	<1-34	14-88	<1-16	<1-7	17-54
FESTUCA IDAHOENSIS/CAREX FILIFOLIA (4)								
Mean	<1	65	53	2	27	1	2	35
Range	0-2	56-76	43-59	<1-8	15-35	<1-2	<1-4	30-43
FESTUCA IDAHOENSIS/STIPA RICHARDSONII (3)								
Mean	4	79	49	7	84	<1	1	35
Range	0-9	73-84	34-57	<1-19	83-85	<1	<1-2	31-42
FESTUCA IDAHOENSIS/AGROPYRON CANINUM (9)								
Mean	<1	73	55	3	52	2	5	35
Range	0-2	61-82	33-68	0-9	26-89	0-12	<1-13	29-41
FEID/AGCA, *GERANIUM VISCOSISSIMUM* Phase (7)								
Mean	<1	77	58	<1	51	<1	3	40
Range	0-2	65-89	39-72	0-1	35-94	<1	<1-6	28-46
FESTUCA IDAHOENSIS/DESCHAMPSIA CAESPITOSA (8)								
Mean	<1	66	50	7	36	2	3	28
Range	0-<1	26-82	25-70	<1-19	18-84	0-7	0-14	20-35
DESCHAMPSIA CAESPITOSA/CAREX SPP. (6)								
Mean	1	88	34	16	76	-	<1	19
Range	0-4	82-92	<1-57	8-26	23-92	-	0-<1	12-27
ARTEMISIA ARBUSCULA/AGROPYRON SPICATUM (3)								
Mean	20	42	17	5	40	23	15	23
Range	14-26	25-65	13-20	3-9	26-49	17-32	13-18	21-27
ARAR/AGSP, *STIPA COMATA* Phase (3)								
Mean	26	24	6	25	23	21	20	23
Range	21-32	22-27	2-10	3-51	13-30	10-24	9-32	21-25
ARTEMISIA ARBUSCULA/FESTUCA IDAHOENSIS (2)								
Mean	14	60	36	28	46	15	5	34
Range	8-21	44-75	13-60	9-46	24-69	7-22	2-8	32-37

APPENDIX A. - Page 3

HABITAT TYPE	CANOPY COVER			BRYO-PHYTES	LITTER	ROCK	BARE SOIL	NUMBER of SPECIES
	Shrubs	Grass	Forbs					
	(Percent Ground Cover)							(No.)
ARTEMISIA TRIDENTATA/AGROPYRON SPICATUM (MONT.) (6)								
Mean	18	41	6	9	42	32	11	21
Range	5-31	24-60	<1-18	2-19	16-66	4-62	2-19	12-31
ARTEMISIA TRIDENTATA/FESTUCA SCABRELLA (6)								
Mean	22	53	20	12	69	16	4	31
Range	6-35	28-79	13-28	5-23	44-84	<1-43	0-12	23-40
ARTEMISIA TRIDENTATA/FESTUCA IDAHOENSIS (MONT.) (8)								
Mean	21	52	27	22	61	7	3	32
Range	5-44	20-78	5-62	11-56	23-82	<1-23	<1-9	17-42
ARTR/FEID (MONT.), *GERANIUM VISCOSISSIMUM* Phase (4)								
Mean	24	87	60	1	80	1	1	41
Range	4-41	74-92	55-67	<1-3	37-95	<1-2	<1-2	38-44
ARTEMISIA TRIPARTITA/FESTUCA IDAHOENSIS (MONT.) (5)								
Mean	23	84	32	6	80	7	4	26
Range	12-31	78-94	13-46	0-17	64-96	0-25	<1-11	14-41
RHUS TRILOBATA/AGROPYRON SPICATUM (4)								
Mean	25	49	9	2	55	53	10	22
Range	3-60	32-60	6-11	<1-3	39-69	29-74	<1-18	19-25
RHUS TRILOBATA/FESTUCA IDAHOENSIS (1)								
Mean	16	45	16	53	56	4	1	45
Range	-	-	-	-	-	-	-	-
POTENTILLA FRUTICOSA/FESTUCA SCABRELLA (5)								
Mean	16	61	30	9	66	19	4	48
Range	10-31	48-73	20-42	<1-16	38-83	<1-55	<1-9	44-53
POFR/FESC, *DANTHONIA INTERMEDIA* Phase (6)								
Mean	26	76	42	8	87	<1	<1	45
Range	8-61	60-94	19-67	0-43	80-97	0-1	0-<1	28-59
POTENTILLA FRUTICOSA/FESTUCA IDAHOENSIS (4)								
Mean	11	78	49	10	78	5	1	35
Range	3-25	68-87	31-74	4-16	70-83	<1-14	<1-3	25-47
PURSHIA TRIDENTATA/AGROPYRON SPICATUM (MONT.) (1)								
Mean	2	60	22	14	77	39	6	21
Range	-	-	-	-	-	-	-	-
PURSHIA TRIDENTATA/FESTUCA SCABRELLA (4)								
Mean	19	71	26	35	75	12	4	32
Range	9-28	63-77	14-36	6-74	69-82	7-17	<1-11	24-37

APPENDIX A. - Page 4

HABITAT TYPE	CANOPY COVER			BRYO-PHYTES	LITTER	ROCK	BARE SOIL	NUMBER of SPECIES
	Shrubs	Grass	Forbs					
	- - - - - - - - - (Percent Ground Cover) - - - - - - - - -							(No.)
CERCOCARPUS LEDIFOLIUS/AGROPYRON SPICATUM (1)								
Mean	27	17	3	26	35	45	8	24
Range	-	-	-	-	-	-	-	-
SARCOBATUS VERMICULATUS/AGROPYRON SMITHII-A. DASYSTACHYUM (1)								
Mean	8	54	1	1	52	<1	19	4
Range	-	-	-	-	-	-	-	-

APPENDIX B. SPECIES CONSTANCY AND AVERAGE CANOPY COVER BY HABITAT TYPES

Table B1.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the *STIPA COMATA/BOUTELOUA GRACILIS* H.T. (STCO/BOGR), and in the *AGROPYRON SMITHII-A. DASYSTACHYUM* Phase (AGSM-AGDA) of this h.t.

HABITAT TYPE	STCO/BOGR	
Phase:	-	AGSM-AGDA
Number of Stands:	7	18
Medium Shrubs		
Chrysothamnus nauseosus	(57) P	(17) P
Chrysothamnus viscidiflorus	(14) P	(6) P
Low Shrubs		
Artemisia frigida	(71) 1	(94) 6
Eurotia lanata	(100) P	(33) P
Gutierrezia sarothrae	(100) 1	(78) P
Opuntia polyacantha	(100) 2	(61) P
Graminoids		
Agropyron dasystachyum	-	(28) 2
Agropyron smithii	-	(72) 6
Agropyron spicatum	(57) P	(50) P
Bouteloua gracilis	(86) 27	(100) 9
Calamagrostis montanensis	-	(56) 2
Carex filifolia	-	(83) 8
Carex stenophylla	(86) 8	(94) 3
Koeleria cristata	(29) P	(78) 6
Oryzopsis hymenoides	(29) P	(6) P
Poa cusickii	-	(28) 1
Poa sandbergii	(57) 1	(67) P
Sporobolus cryptandrus	(43) 1	-
Stipa comata	(86) 25	(100) 33
Stipa viridula	-	(17) 1
Forbs		
Astragalus purshii	(57) P	(22) P
Chrysopsis villosa	(14) P	(56) P
Gaura coccinea	(14) P	(61) P
Hymenoxys acaulis	-	(33) P
Lepidium spp.	(29) P	(22) P
Liatris punctata	-	(72) P
Lygodesmia juncea	-	(50) P
Melilotus officinalis	-	(33) P
Paronychia sessiliflora	-	(39) 1
Phlox hoodii	(43) 1	(83) 5
Senecio canus	-	(28) P
Sphaeralcea coccinea	(100) P	(94) 1
Taraxacum officinale	(29) P	(44) P
Thelesperma marginatum	-	(44) P
Tragopogon dubius	(43) P	(61) P
Vicia americana	-	(28) 1

Table B2.--(Percent constancy) and average canopy in percent (P = <.5% cover) of important plants in the following habitat types within the *Agropyron spicatum* Series: *AGROPYRON SPICATUM/BOUTELOUA GRACILIS* H.T. (AGSP/BOGR), and *LIATRIS PUNCTATA* Phase (LIPUN); *A. SPICATUM/AGROPYRON SMITHII-A. DASYSTACHYUM* H.T. (AGSP/AGSM-AGDA), and *STIPA VIRIDULA* Phase (STVI); and *A. SPICATUM/POA SANDBERGII* (MONT.) H.T. (AGSP/POSAN).

HABITAT TYPE	AGSP/BOGR		AGSP/AGSM-AGDA		AGSP/POSAN	
Phase	-	LIPUN	-	STVI	STCO	-
Number of Stands	9	16	9	7	9	8
Medium Shrubs						
Artemisia cana	-	-	-	(29) P	-	-
Artemisia tridentata	(33) P	(6) P	(22) P	(29) P	(22) P	(25) P
Chrysothamnus nauseosus	(67) P	(25) P	(67) 1	(29) P	(33) P	(50) P
Chrysothamnus viscidiflorus	(44) P	(6) P	(33) P	-	(11) 1	(38) 1
Juniperus scopulorum	-	-	-	(14) P	(22) P	(13) P
Rhus trilobata	-	-	(11) P	(14) P	-	(25) 1
Rosa arkansana	(11) P	(19) P	(11) P	(29) P	(22) P	(13) P
Low Shrubs						
Artemisia dracunculus	(44) P	(19) P	-	(14) P	(22) P	(25) P
Artemisia frigida	(100) 6	(100) 4	(89) 2	(100) 5	(89) 2	(88) 2
Eurotia lanata	-	(19) P	(11) P	-	(22) 1	-
Gutierrezia sarothrae	(100) 2	(69) P	(89) 1	(100) 3	(56) 1	(38) 2
Leptodactylon pungens	(11) P	-	-	-	-	-
Opuntia polyacantha	(78) 1	(56) P	(22) P	(57) P	(44) P	(38) P
Yucca glauca	(11) P	(19) P	-	-	-	-
Graminoids						
Agropyron dasystachyum	-	(13) P	(56) 2	(14) 3	-	-
Agropyron smithii	-	(19) 1	(44) 1	(86) 4	-	-
Agropyron spicatum	(100) 15	(100) 24	(100) 18	(100) 16	(100) 20	(100) 46
Aristida longiseta	-	(13) P	(11) P	(29) 1	(11) 1	(25) 1
Bouteloua gracilis	(100) 10	(100) 5	(22) P	(29) P	(22) P	-
Bromus japonicus	(11) P	(13) P	-	(14) P	-	-
Bromus mollis	-	(6) P	-	-	(11) P	(13) P
Bromus tectorum	-	(25) P	(22) P	(57) P	(33) 1	(38) 1
Calamagrostis montanensis	-	(44) P	(44) P	(14) P	(11) 1	(13) 2
Carex filifolia	-	(69) 3	(11) 1	(29) 1	(22) 2	-
Carex stenophylla	(78) 2	(94) 1	(78) 2	(86) 1	-	(13) P
Festuca idahoensis	-	-	(11) P	-	-	(13) P
Festuca octoflora	-	(6) P	-	-	(22) P	(13) P
Festuca scabrella	-	-	(11) P	(14) P	(22) P	(25) P
Helictotrichon hookeri	-	-	(11) 2	-	-	-
Koeleria cristata	(67) 3	(100) 6	(100) 8	(100) 7	(89) 5	(75) 3
Muhlenbergia cuspidata	-	(25) 1	(11) P	-	-	-
Oryzopsis hymenoides	(11) P	-	-	-	(11) P	(38) 1
Poa cusickii	-	(31) 1	(67) 3	(57) 4	(11) P	(13) P
Poa pratensis	-	(6) P	-	-	(22) P	(13) P
Poa sandbergii	(100) 3	(81) 1	(78) 3	(71) 3	(100) 3	(75) 8
Stipa comata	(100) 8	(100) 14	(100) 6	(86) 4	(89) 19	-
Stipa viridula	-	(19) 1	-	(100) 6	(11) 1	-
Stipa spartea	-	-	-	-	(11) P	-

HABITAT TYPE	AGSP/BOGR				AGSP/AGSM-AGDA				AGSP/POSAN			
Phase	-		LIPUN		-		STVI		STCO		-	
Number of Stands	9		16		9		7		9		8	
Forbs												
Achillea millefolium	-		(38)	P	(44)	P	(43)	P	(56)	1	(75)	2
Agoseris glauca	-		(6)	P	-		(29)	P	-		(13)	P
Allium cernuum	(11)	P	(44)	P	(67)	1	(29)	P	(33)	P	(25)	P
Antennaria dimorpha	-		-		(22)	P	(14)	P	(22)	P	(13)	P
Antennaria parvifolia	(22)	P	(38)	P	(44)	P	(14)	P	(11)	P	-	
Antennaria rosea	(11)	P	(31)	P	(44)	P	(28)	P	(33)	P	(38)	P
Arabis holboellii	(33)	P	(6)	P	(44)	P	(28)	P	(33)	P	(50)	P
Arenaria congesta	-		(6)	P	(22)	P	(14)	P	(11)	P	(25)	P
Artemisia ludoviciana	-		(31)	1	-		(43)	1	(11)	P	-	
Aster falcatus	-		(13)	P	(11)	P	(43)	1	(11)	P	-	
Aster scopulorum	(33)	P	-		(11)	P	(29)	P	-		-	
Astragalus drummondii	-		(6)	P	(11)	P	(29)	P	(22)	1	-	
Astragalus miser	-		-		-		-		(33)	1	(25)	1
Astragalus purshii	(22)	P	(13)	P	(44)	P	(43)	P	(56)	1	-	
Balsamhoriza incana	-		-		-		(29)	1	-		-	
Balsamhoriza sagittata	-		-		-		-		(44)	3	(25)	2
Besseya wyomingensis	-		(13)	P	(11)	P	(29)	P	(11)	P	(13)	P
Cerastium arvense	-		(6)	P	(22)	P	(14)	P	(22)	1	(13)	P
Chrysopsis villosa	(33)	P	(81)	1	(67)	1	(86)	3	(56)	2	(50)	P
Cirsium undulatum	-		(25)	P	(11)	P	-		(33)	P	(25)	P
Collinsia parviflora	-		-		-		-		(11)	P	(13)	P
Collomia linearis	-		-		-		-		(11)	P	(25)	P
Comandra umbellata	-		(25)	P	(22)	P	(43)	1	(67)	1	(50)	1
Crepis occidentalis	-		(25)	P	(33)	P	(43)	P	-		(25)	P
Cryptantha celosioides	(11)	P	(38)	P	(22)	P	(29)	P	(56)	P	-	
Draba verna	-		-		-		-		(11)	P	(50)	1
Epilobium minutum	-		-		-		-		(22)	P	(25)	1
Erigeron caespitosus	-		(44)	P	(44)	P	(43)	1	(33)	P	(13)	P
Erigeron compositus	(22)	P	-		(44)	P	(29)	1	(44)	P	(13)	P
Erigeron filifolius	(33)	P	(19)	P	(22)	P	(29)	P	(22)	P	-	
Erigeron pumilis	-		(6)	P	-		-		(22)	P	(25)	P
Eriogonum flavum	-		-		(22)	P	(14)	P	(22)	P	(25)	P
Eriogonum microthecum	(56)	P	-		-		-		(22)	P	(50)	P
Eriogonum ovalifolium	-		(6)	P	(11)	P	(29)	P	-		-	
Gaillardia aristata	-		(19)	P	-		-		(22)	P	(25)	P
Gaura coccinea	(33)	P	(56)	P	(22)	P	(43)	P	(56)	P	(38)	P
Geum triflorum	-		-		(33)	P	-		-		(25)	P
Hymenoxys acaulis	-		(19)	P	(22)	1	(29)	1	(22)	P	-	
Lappula echinata	(11)	P	-		-		-		-		-	
Lappula redowskii	-		-		-		-		(11)	P	(25)	P
Lesquerella alpina	-		(13)	P	(11)	P	(29)	P	(22)	P	-	
Lepidium spp.	(33)	P	(31)	P	(56)	1	(71)	1	(22)	P	(13)	1
Liatris punctata	-		(94)	1	(22)	P	(43)	P	(22)	P	(13)	P
Linum perenne	-		(25)	P	(33)	P	(14)	P	(44)	P	(13)	P
Lithospermum ruderale	(11)	P	(13)	P	-		(14)	P	(44)	P	(25)	P
Lomatium cous	-		(6)	P	-		(14)	P	(22)	P	-	
Lomatium triternatum	-		-		(11)	P	-		-		(25)	P
Lupinus sericeus	-		(6)	P	(11)	P	(43)	P	(33)	P	(63)	1
Lygodesmia juncea	(11)	P	(25)	P	-		(14)	P	(22)	P	-	
Oxytropis riparia	(33)	P	(19)	1	-		(14)	P	-		-	
Oxytropis sericea	(11)	P	(13)	P	-		(14)	P	(22)	P	(13)	1

Table B2. - Page 3

HABITAT TYPE	AGSP/BOGR				AGSP/AGSM-AGDA				AGSP/POSAN			
Phase	-		LIPUN		-		STVI		STCO		-	
Number of Stands	9		16		9		7		9		8	
Forbs (Continued)												
Paronychia sessiliflora	-		(19)	P	(11)	1	(29)	P	(11)	P	-	
Phacelia hastata	-		-		-		-		-		(25)	P
Phlox hoodii	(78)	2	(100)	3	(89)	6	(100)	7	(67)	3	(38)	3
Plantago purshii	(22)	P	(13)	P	(11)	P	(29)	P	(11)	P	(25)	P
Polygonum douglasii	-		-		-		(29)	P	-		-	
Potentilla pensylvanica	-		(13)	P	(22)	P	(29)	P	-		-	
Psoralea tenuiflora	-		(31)	1	-		(29)	P	-		-	
Sedum lanceolatum	(22)	P	-		(33)	P	-		(11)	P	-	
Senecio canus	(11)	P	(50)	P	(33)	1	(29)	P	(44)	P	(25)	P
Solidago missouriensis	-		(19)	P	-		(29)	P	(11)	P	-	
Sphaeralcea coccinea	(89)	P	(50)	P	(78)	P	(86)	P	(44)	P	(25)	P
Taraxacum officinale	(11)	P	(50)	P	(44)	P	(29)	P	(22)	P	(38)	P
Thelasperma marginatum	-		(25)	P	-		-		-		-	
Tragopogon dubius	(44)	P	(88)	1	(67)	P	(100)	1	(89)	P	(75)	1
Vicia americana	-		(25)	1	-		(86)	3	-		(25)	P

Table B3.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the following habitat types within the *Festuca scabrella* Series: *FESTUCA SCABRELLA/AGROPYRON SPICATUM* H.T. (FESC/AGSP), with *STIPA COMATA* Phase (STCO); and *F. SCABRELLA/FESTUCA IDAHOENSIS* H.T. (FESC/FEID), with *GERANIUM VISCOSISSIMUM* (GEVI) and *STIPA RICHARDSONII* (STRI) phases.

HABITAT TYPE	FESC/AGSP		FESC/FEID		
Phase	STCO	-	-	GEVI	STRIC
Number of Stands	23	25	19	12	15
Medium Shrubs					
Rosa arkansana	(39) P	(28) P	(16) P	(8) 1	(53) 1
Tetradymia canescens	(22) P	(12) P	-	-	-
Low Shrubs					
Artemisia campestris	(26) P	-	(16) P	-	-
Artemisia dracunculus	(26) P	(8) P	-	(25)	-
Artemisia frigida	(100) 3	(48) 1	(37) 1	(17) P	-
Gutierrezia sarothrae	(61) P	(16) P	-	-	-
Graminoids					
Agropyron caninum	(13) P	-	(58) 1	(25) P	(47) 1
Agropyron dasystachyum	-	-	(26) 1	-	-
Agropyron smithii	(39) 1	(12) P	(21) 1	(8) P	(7) P
Agropyron spicatum	(96) 17	(100) 12	(37) P	(100) 6	(47) 2
Bouteloua gracilis	(48) 1	-	-	-	-
Bromus carinatus	-	-	(5) P	(25) P	(7) P
Bromus japonicus	(9) P	(4) P	-	-	-
Bromus mollis	-	(12) P	(5) P	(8) P	-
Bromus tectorum	(13) P	(36) P	(5) P	-	-
Calamagrostis montanensis	(13) P	(8) P	(37) P	-	-
Carex filifolia	(48) 1	(28) 1	(42) 1	(17) 1	(80) 10
Carex obtusata	(9) P	(12) P	(47) 2	(42) 2	(20) 1
Carex petasata	(9) P	(24) P	(42) 1	(67) 1	(40) 1
Carex pennsylvanica	(22) 1	(4) P	(26) 2	(8) 1	(13) 2
Carex rupestris	-	-	(5) 1	(8) 1	(7) P
Carex scirpoidea	-	-	-	(8) P	(13) 1
Carex stenophylla	(57) 1	(36) 1	(16) 1	-	(13) 1
Carex vallicola	-	(8) P	(11) 1	-	(40) 2
Danthonia intermedia	-	(8) P	(58) 2	(67) 1	(93) 5
Danthonia parryi	(13) P	-	(16) 3	-	-
Danthonia unispicata	(17) P	(12) P	(21) 2	(25) P	-
Festuca idahoensis	(70) 10	(100) 19	(100) 15	(100) 20	(93) 11
Festuca scabrella	(100) 28	(100) 34	(100) 49	(100) 34	(100) 59
Helictotrichon hookeri	(17) P	-	(16) P	(8) P	(7) P
Koeleria cristata	(100) 4	(96) 3	(95) 2	(100) 3	(100) 1
Muhlenbergia cuspidata	(35) 1	-	-	-	-
Poa cusickii	(48) P	(20) 1	(26) 1	-	-
Poa pratensis	(4) P	(24) 1	(11) P	(42) 4	(13) P
Poa sandbergii	(48) 1	(76) 3	(26) P	(50) 1	(20) P
Stipa comata	(70) 1	(4) P	-	-	-
Stipa occidentalis	-	(20) P	(32) P	(67) 4	(47) 1
Stipa richardsonii	-	(12) P	-	-	(93) 15
Stipa spartea	(17) P	(4) P	(16) 1	(17) P	-
Stipa viridula	(17) P	(8) P	-	(33) P	-

Table B3. - Page 2

HABITAT TYPE	FESC/AGSP				FESC/FEID					
Phase	STCO		-		-		GEVI		STRIC	
Number of Stands	23		25		19		12		15	
Forbs										
Achillea millefolium	(65)	1	(100)	3	(95)	2	(100)	3	(100)	2
Agoseris glauca	(39)	P	(36)	P	(53)	2	(50)	1	(40)	P
Allium cernuum	(70)	1	(22)	P	(42)	P	(75)	P	(33)	P
Anaphalis margaritacea	-		-		(21)	P	(33)	P	(40)	P
Androsace septentrionalis	(30)	P	(12)	P	(26)	P	(8)	P	-	
Anemone cylindrica	-		-		-		(8)	P	-	
Anemone drummondii	-		-		(5)	P	-		(7)	P
Anemone multifida	-		(8)	P	(11)	P	(17)	P	(7)	P
Anemone patens	-		(8)	P	(32)	P	(25)	P	(47)	1
Antennaria anaphaloides	-		(4)	P	-		(42)	1	-	
Antennaria parvifolia	(39)	1	(12)	P	(5)	P	(17)	P	(13)	1
Antennaria rosea	(48)	P	(96)	3	(84)	1	(83)	2	(87)	1
Arabidopsis thaliana	-		(56)	P	(21)	P	(42)	P	(27)	P
Arenaria congesta	(48)	1	(48)	1	(74)	2	(75)	2	(73)	2
Arnica fulgens	(9)	P	(20)	P	(32)	1	(33)	1	(13)	P
Arnica sororia	(9)	P	(44)	1	(5)	P	(33)	1	(7)	1
Artemisia ludoviciana	(52)	1	(12)	P	(26)	P	(25)	P	(33)	P
Aster falcatus	(26)	P	-		(16)	P	(8)	P	(7)	P
Aster integrifolius	-		-		(16)	1	-		(27)	1
Astragalus miser	-		(24)	1	(11)	P	(17)	P	(7)	P
Astragalus striatus	(30)	P	(4)	P	(21)	P	(8)	P	-	
Balsamorhiza incana	(17)	P	(4)	P	-		(8)	P	-	
Balsamorhiza sagittata	(4)	P	(40)	2	(5)	P	(33)	P	(7)	P
Besseya wyomingensis	(9)	P	(52)	1	(37)	1	(50)	1	(40)	P
Campanula rotundifolia	(13)	P	(24)	P	(74)	1	(83)	1	(47)	P
Castelleja lutescens	-		(44)	P	(5)	P	(17)	P	-	
Cerastium arvense	(48)	1	(60)	3	(95)	1	(75)	2	(40)	1
Chrysopsis villosa	(96)	1	(56)	1	(21)	P	(17)	P	(7)	P
Comandra umbellata	(61)	P	(20)	P	(11)	P	-		(7)	P
Erigeron caespitosus	(35)	P	(32)	P	(37)	P	(17)	P	(40)	1
Erigeron compositus	(17)	P	(32)	P	(11)	P	(17)	P	-	
Erigeron carymbosus	(26)	P	(32)	1	-		(17)	P	(7)	P
Erigeron speciosus	-		(8)	P	(11)	P	(67)	2	(13)	P
Erigeron subtrinervis	-		-		(11)	P	(25)	1	(20)	P
Eriogonum umbellatum	(30)	P	(24)	P	(26)	P	(75)	2	(87)	3
Gaillardia aristata	(57)	P	(48)	P	(58)	1	(50)	P	(27)	P
Galium boreale	(22)	P	(28)	P	(74)	2	(58)	1	(73)	3
Gaura coccinea	(52)	P	(16)	P	-		-		-	
Gentiana affinis	-		-		(21)	P	(8)	P	(33)	P
Geranium viscosissimum	(4)	P	(20)	P	-		(100)	6	(87)	4
Geum triflorum	(43)	P	(60)	P	(89)	4	(83)	3	(80)	4
Heuchera spp.	(4)	P	(28)	P	(26)	P	(33)	P	(60)	1
Hieracium albertinum	-		(32)	P	(5)	P	(58)	1	(40)	P
Hymenoxys acaulis	(26)	P	-		-		-		-	
Liatris punctata	(74)	1	(8)	P	-		-		-	
Lithospermum ruderale	(48)	P	(52)	P	(32)	P	(67)	1	(60)	P
Lomatium triternatum	(4)	P	(68)	P	(11)	P	(75)	P	(27)	P
Lupinus sericeus	(52)	2	(72)	4	(58)	4	(58)	4	(33)	4
Orthocarpus tenuifolius	-		(24)	P	-		(8)	P	(7)	P

Table B3. - Page 3

HABITAT TYPE	FESC/AGSP				FESC/FEID					
Phase	STCO		-		-		GEVI		STRIC	
Number of Stands	23		25		19		12		15	
Forbs (Continued)										
Oxytropis campestris	(9)	P	-		(11)	P	-		(7)	P
Oxytropis deflexa	-		-		-		(8)	P	-	
Oxytropis lagopus	(9)	P	(4)	P	-		-		-	
Oxytropis sericea	(22)	P	(4)	P	(5)	P	-		-	
Oxytropis viscida	(17)	P	-		-		-		-	
Penstemon procerus	-		(12)	P	(32)	P	(33)	1	(53)	1
Petalostemon purpureum	(30)	P	(4)	P	-		-		-	
Phlox albamarginata	(26)	1	(4)	P	-		-		-	
Phlox hoodii	(52)	1	(12)	P	(53)	1	(8)	P	-	
Potentilla arguta	(4)	P	(28)	P	-		(42)	P	(53)	P
Potentilla gracilis	(9)	P	(44)	P	(37)	P	(100)	3	(93)	2
Potentilla hippeana	(26)	P	(12)	P	(32)		-		-	
Senecio canus	(35)	P	(12)	P	(11)	P	-		(7)	P
Solidago missouriensis	(61)	P	(28)	P	(42)	1	(42)	1	(33)	1
Taraxacum officinale	(26)	P	(68)	1	(63)	P	(42)	P	(40)	P
Thermopsis rhombifolia	(30)	1	(4)	P	(26)	P	-		-	
Tragopogon dubius	(74)	P	(72)	P	(21)	P	(42)	P	(20)	P
Vicia americana	(43)	P	(16)	P	(16)	P	(17)	P	-	
Zigadenus venenosus	(17)	P	(44)	P	(37)	P	(42)	P	(20)	P

Table B4.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the following habitat types within the *Festuca idahoensis* Series: *FESTUCA IDAHOENSIS/AGROPYRON SMITHII-A. DASYSTACHYUM* H.T. (FEID/AGSM-AGDA); *F. IDAHOENSIS/AGROPYRON SPICATUM* H.T. (FEID/AGSP), with *STIPA OCCIDENTALIS* Phase (STOC); *F. IDAHOENSIS/CAREX FILIFOLIA* H.T. (FEID/CAFI); *F. IDAHOENSIS/STIPA RICHARDSONII* H.T. (FEID/STRI); *F. IDAHOENSIS/AGROPYRON CANINUM* H.T. (FEID/AGCA), with *GERANIUM VISCOSISSIMUM* Phase (GEVI); and *F. IDAHOENSIS/DESCHAMPSIA CAESPITOSA* H.T. (FEID/DECA).

HABITAT TYPE	FEID/AGSM-AGDA		FEID/AGSP			FEID/CAFI		FEID/STRIC		FEID/AGCA			FEID/DECA	
Phase	-		-		STOC	-		-		-		GEVI	-	
Number of Stands	10		46		15	4		3		9		7	8	
Medium Shrubs														
Artemisia cana	(30)	P	(7)	P	-	-		-		-		-	-	
A. tridentata	(20)	P	(35)	P	(33)	P	(25)	P	-		-		(43)	P	-	
Chrysothamnus nauseosus	(30)	P	(20)	P	-	-		-		-		-	-	
C. viscidiflorus	(30)	P	(39)	1	(20)	P	-		-		(11)	P	-		-	
Potentilla fruticosa	-		(4)	P	(7)	P	-		(33)	P	-		-		-	
Rosa arkansana	-		(15)	P	-		-		(67)	4	-		(14)	P	-	
Tetradymia canescens	(20)	P	(33)	P	-		-		-		-		-		-	
Low Shrubs														
Artemisia frigida	(90)	3	(83)	2	(53)	1	-		-		-		-		-	
Gutierrezia sarothrae	(10)	P	(33)	P	-		-		-		-		-		-	
Graminoids														
Agropyron caninum	-		(2)	P	(60)	2	(100)	1	(67)	3	(100)	9	(100)	11	(63)	3
A. dasystachyum	(70)	9	(2)	P	(7)	P	-		(33)	1	-		(14)	1	-	
A. smithii	(40)	5	(20)	1	-		-		-		-		-		-	
A. spicatum	(50)	P	(100)	18	(100)	15	(75)	P	(33)	P	(22)	1	(43)	1	-	
Agrostis scabra	-		-		-		(50)	P	-		(22)	1	-		(38)	2
Bouteloua gracilis	(10)	P	(9)	P	-		-		-		-		-		-	
Bromus anomalus	-		-		(13)	P	-		(33)	P	(44)	1	(57)	2	-	
B. carinatus	-		-		(7)	P	-		-		(44)	1	(86)	6	(13)	1
B. ciliatus	-		-		(7)	P	-		(33)	1	-		(14)	1	-	
B. japonicus	-		(2)	P	-		-		(33)	P	-		-		-	
B. mollis	-		(4)	P	-		-		-		-		-		-	
B. tectorum	-		(22)	P	(7)	P	-		-		-		-		-	
Carex albonigra	-		-		-		-		-		-		-		(13)	4
C. capillaris	-		-		-		-		-		-		-		(25)	1
C. filifolia	(40)	1	(20)	P	(47)	1	(100)	8	-		(11)	P	-		(25)	P
C. haydeniana	(10)	P	-		-		-		-		-		-		(25)	2
C. hoodii	-		-		(7)	2	-		-		-		(14)	P	-	
C. obtusata	-		(4)	P	(27)	5	-		-		(22)	3	(29)	6	-	
C. pennsylvanica	-		(4)	P	(7)	P	-		-		-		(14)	5	-	
C. petasata	-		(2)	P	(67)	5	(100)	1	(67)	4	(78)	2	(100)	1	(63)	P
C. platylepis	-		-		-		-		-		-		-		(13)	2
C. practicola	-		(2)	P	-		-		-		(11)	P	-		(13)	P
C. rupestris	-		-		-		(50)	14	-		-		-		-	
C. scirpoidea	-		-		-		-		(33)	2	-		-		(50)	5
C. spectabilis	-		-		-		-		-		(11)	P	(29)	P	-	
C. stenophylla	(50)	2	(59)	P	(27)	2	(50)	2	-		(56)	2	(71)	1	(25)	P
C. vallicola	-		-		-		-		-		(11)	1	-		-	

Table B4. - Page 2

HABITAT TYPE	FEID/AGSM -AGDA		FEID/AGSP				FEID/CAFI		FEID/ STRIC		FEID/AGCA				FEID/DECA	
Phase	-		-		STOC		-		-		-		GEVI		-	
Number of Stands	10		46		15		4		3		9		7		8	
Graminoids(continued)																
Danthonia intermedia	-		(4)	P	(53)	4	(100)	10	(100)	6	(89)	15	(86)	4	(50)	5
D. unispicata	(10)	1	(9)	P	-		-		-		-		-		-	
Deschampsia caespitosa	-		-		-		-		-		-		-		(100)	17
Festuca idahoensis	(100)	43	(100)	36	(100)	31	(100)	29	(100)	12	(100)	36	(100)	24	(100)	21
F. scabrella	-		(7)	P	-		-		(33)	1	(11)	P	-		-	
Juncus balticus	-		-		-		-		-		-		-		(13)	P
J. tenuis	-		-		-		-		-		-		-		(13)	P
Koeleria cristata	(100)	5	(98)	4	(93)	4	(50)	1	(100)	P	(100)	4	(100)	4	(38)	P
Luzula spicata	-		-		-		(50)	P	-		-		-		(75)	2
Melica bulbosa	-		-		(7)	P	-		-		-		(29)	1	-	
M. spectabilis	-		-		-		-		-		-		-		(13)	1
Phleum alpinum	-		-		-		-		-		-		-		(63)	2
P. pratense	-		(9)	P	-		-		(33)	P	(11)	P	(29)	2	-	
Poa cusickii	(70)	4	(22)	1	(53)	1	-		(33)	P	-		-		-	
P. fendleriana	-		-		-		(50)	P	-		-		-		-	
P. interior	-		-		(7)	P	(50)	P	-		(33)	P	(43)	P	(38)	1
P. juncifolia	(30)	P	(4)	P	(33)	P	(25)	P	(67)	2	(22)	P	(86)	3	(25)	P
P. pratensis	(10)	P	(11)		-		-		(33)	P	-		(29)	5	-	
P. sandbergii	(30)	4	(80)	3	(47)	1	(75)	P	-		(33)	P	-		(38)	P
Stipa comata	(20)	P	(59)	3	(13)	P	-		-		-		-		-	
S. occidentalis	-		(4)	P	(100)	6	-		(100)	13	(100)	7	(86)	7	(13)	3
S. richardsonii	-		-		(13)	P	-		(100)	36	(22)	P	(29)	2	-	
S. viridula	-		(9)	P	-		-		(33)	1	-		-		-	
Trisetum spicatum	-		-		-		(25)	P	-		-		-		(50)	1
T. wolfii	-		-		-		-		-		-		-		(25)	1
Forbs																
Achillea millefolium	(70)	1	(85)	1	(100)	3	(100)	4	(100)	5	(100)	5	(100)	6	(63)	3
Agoseris glauca	(50)	2	(50)	2	(100)	2	(100)	2	(33)	1	(100)	2	(86)	2	(50)	2
A. grandiflora	-		-		(7)	P	-		-		(22)	1	(43)	P	(13)	P
Allium cernuum	(60)	P	(74)	1	(67)	P	(25)	P	(33)	1	-		-		-	
Anaphalis margitacea	-		-		(27)	P	(25)	1	-		(11)	P	(71)	P	(13)	1
Androsace septentrionalis	-		(7)	P	-		-		-		(22)	P	(57)	P	(25)	P
Anemone patens	-		(4)	P	(20)	P	(50)	P	(33)	P	-		(14)	P	-	
Antennaria rosea	(60)	1	(83)	2	(80)	3	(100)	7	(100)	P	(78)	1	(71)	P	(38)	1
Arabis drummondii	(10)	P	-		(13)	P	(50)	P	-		-		-		(25)	P
Arenaria congesta	(50)	1	(67)	1	(93)	3	(100)	4	(33)	1	(89)	2	(100)	1	(13)	P
Arnica fulgens	(20)	P	(20)	P	(33)	1	-		-		(22)	P	-		(13)	P
A. sororia	-		(2)	P	-		-		-		-		-		-	
Artemisia ludoviciana	(40)	3	(26)	1	(13)	1	-		(33)	P	-		-		-	
Aster alpigenus	-		-		-		-		-		-		-		(13)	1
A. campestris	-		(2)	P	(7)	P	-		(33)	1	-		(14)	P	-	
A. foliaceus	-		-		-		-		-		-		(14)	P	(38)	1
A. integrifolius	-		(2)	P	(27)	2	-		-		(22)	2	(29)	P	-	
Astragalus miser	-		(30)	1	(20)	P	(25)	P	(33)	4	(22)	P	(29)	P	-	
A. purshii	(40)	1	(30)	P	(13)	P	-		-		(11)	P	-		-	
Balsamorhiza incana	(20)	1	(2)	P	-		-		-		-		-		-	
B. sagittata	-		(30)	1	-		-		-		-		-		-	
Besseya wyomingensis	(30)	1	(26)		(60)	1	(75)	2	(33)	P	(44)	P	(57)	P	(25)	P

Table B4. - Page 3

HABITAT TYPE	FEID/AGSM -AGDA		FEID/AGSP			FEID/CAFI		FEID/ STRIC		FEID/AGCA			FEID/DECA	
Phase	-		-		STOC	-		-		-		GEVI	-	
Number of Stands	10		46		15	4		3		9		7	8	
Forbs(continued)														
Bupleurum americanum	(10)	P	(7)	P	(20)	P	-		(33)	P	-		-	(13) P
Calochortus spp.	(10)	P	(15)	P	(20)	P	-		(67)	P	-		-	-
Campanula rotundifolia	(30)	1	(22)	P	(80)	1	(75)	1	(100)	1	(78)	1	(71) 1	-
Castelleja cervina	(10)	P	(15)	P	(13)	P	(25)	P	-		-		-	-
C. puchella	-		-		-		(50)	P	-		-		-	(25) P
Cerastium arvense	(50)	4	(46)	2	(87)	4	(100)	2	(33)	P	(78)	4	(57) 1	(50) 1
Chrysopsis villosa	(40)	2	(61)	1	(13)	P	-		(67)	3	-		(14) P	-
Clematis hirsutissima	(10)	1	(11)	P	(53)	1	-		-		(11)	P	(57) P	-
Collomia linearis	(20)	P	(13)	P	(30)	P	-		-		(44)	1	(86) 1	-
Comandra umbellata	(10)	P	(35)	P	-		-		-		-		-	-
Dodecatheon conjugens	(10)	P	(24)	P	(47)	P	(50)	P	(33)	P	(67)	P	(57) P	(25) P
Erigeron caespitosus	(40)	1	(57)	2	(53)	1	(50)	P	-		-		-	(13) P
E. compositus	-		(35)	P	(20)	P	-		-		(11)	P	-	(25) 1
E. corymbosus	-		(13)	P	(7)	P	-		(33)	P	(22)	P	(14) P	(13) P
E. filifolius	(20)	P	(7)	P	(20)	P	-		-		-		-	-
E. speciosus	-		(2)	P	(7)	P	-		(33)	2	(56)	3	(43) 2	(13) P
E. subtrinervis	-		(4)	P	(27)	P	-		-		(33)	1	(57) 2	-
Eriogonum umbellatum	(10)	P	(15)	P	(46)	2	-		(33)	P	(56)	1	(57) 3	-
Erysimum incospicuum	-		-		(7)	P	(50)	P	-		(46)	P	(43) P	-
Frasera speciosa	(20)	P	(11)	P	(46)	P	(25)	P	-		(33)	P	(14) P	-
Gaillardia aristata	(70)	2	(39)	P	(73)	3	-		(67)	1	(33)	P	(29) P	-
Galium boreale	(20)	P	(11)	P	(67)	2	-		(67)	10	(11)	1	(14) P	(13) P
Gaura coccinea	(20)	P	(28)	P	(7)	P	-		-		-		-	-
Gentiana affinis	-		(4)	P	(20)	P	(100)	5	(33)	P	(33)	P	-	(13) P
G. amarella	-		-		-		-		-		-		-	(25) P
Geranium viscosissimum	-		-		(20)	P	-		(100)	8	(11)	P	(100) 14	(13) P
Geum rossii	-		-		-		-		-		-		-	(25) 6
G. triflorum	(30)	P	(39)	P	(73)	3	(100)	16	(67)	1	(89)	15	(100) 11	(25) 2
Heuchera spp.	(20)	P	(17)	P	(20)	P	-		(33)	P	(11)	P	(14) P	-
Hieracium albertinum	-		(2)	P	(7)	P	-		(33)	P	(11)	P	-	-
Lepidium spp.	(10)	P	(30)	P	-		-		-		-		-	(13) P
Linum perenne	(20)	P	(26)	P	(40)	P	-		(33)	P	(22)	P	(29) P	-
Lithospermum ruderale	-		(26)	P	(7)	P	-		(33)	P	-		(14) P	-
Lomatium cous	-		(17)	P	(13)	P	(75)	P	-		(11)	P	-	-
L. triternatum	-		(15)	P	-		-		-		-		-	-
Lupinus argenteus	-		-		-		(75)	1	-		(11)	1	(14) P	(63) 3
L. sericeus	(30)	1	(59)	3	(67)	4	(25)	1	(33)	1	(46)	3	(57) 4	-
Mertensia oblongifolia	-		(9)	P	(7)	P	(25)	P	-		-		-	-
Oxytropis lagopus	-		(13)	P	-		-		-		-		-	-
O. riparia	-		(15)	P	(7)	P	-		-		-		-	-
O. sericea	-		(15)	P	(20)	P	(75)	1	-		(11)	P	(14) P	-
Pedicularis contorta	-		(2)	P	(40)	2	(50)	P	-		(11)	P	-	(25) P
Penstemon procerus	-		-		(7)	1	(50)	1	-		(56)	1	(14) P	(50) 1
Perideridia gairdneri	-		(2)	P	-		-		-		(11)	P	(57) P	-
Phlox hoodii	(80)	5	(67)	3	(60)	4	-		(33)	P	(22)	1	-	(13) P
P. longifolia	(10)	P	(24)	1	(20)	P	-		-		(22)	P	(14) P	-
P. multiflora	(10)	1	(9)	P	(27)	1	(50)	3	(33)	P	(56)	1	(14) P	(13) P
Polygonum bistortoides	-		(2)	P	(40)	P	(100)	3	-		(33)	P	(14) P	(88) 3
P. douglasii	(10)	P	(2)	P	-		-		-		(46)	P	(57) 1	-

Table B4. - Page 4

HABITAT TYPE	FEID/AGSM -AGDA		FEID/AGSP			FEID/CAFI		FEID/ STRIC		FEID/AGCA			FEID/DECA	
Phase	-		-		STOC	-		-		-		GEVI	-	
Number of Stands	10		46		15	4		3		9		7	8	
Forbs(continued)														
Potentilla arguta	-		-		(13) P	-		(67)	1	(22)	P	(43) 2	-	
P. diversifolia	-		-		(7) P	(75)	2	(33)	1	(46)	P	(14) P	(88)	6
P. gracilis	-		(4)	P	(33) P	(75)	2	(67)	4	(89)	3	(100) 11	(25)	1
P. pensylvanica	(10)	P	(15)	P	(40) P	-		(33)	P	-		(14) P	-	
Saxifraga montanensis	-		-		(7) P	(25)	P	-		(22)	P	-	-	
Sedum lanceolatum	(10)	P	(28)	P	(33) P	(25)	P	-		(11)	P	-	(50)	P
Senecio canus	(20)	P	(24)	P	(13) P	-		-		-		-	-	
Silene oregana	-		-		-	-		-		(22)	P	(29) P	-	
S. parryi	-		(11)	P	(13) P	(25)	P	-		(22)	P	(14) P	-	
Solidago missouriensis	(20)	P	(28)	P	(27) P	(25)	P	(67)	1	(33)	P	(14) P	(25)	1
Taraxacum officinale	(50)	1	(67)	P	(80) 1	-		(67)	1	(78)	P	(86) P	-	
Tragopogon dubius	(40)	P	(76)	1	(13) P	-		(67)	P	(11)	P	(14) P	-	
Trifolium spp.	-		(2)	P	-	-		-		(33)	2	(14) P	(88)	5
Vicia americana	(20)	1	(15)	P	(13) 1	-		(33)	1	-		-	-	
Zigadenus venenosus	(10)	P	(43)	P	(53) P	(25)	P	(33)	P	(22)	P	-	-	

Table B5.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the *DESCHAMPSIA CAESPITOSA/CAREX* SPP. H.T. (DECA/CAREX).

HABITAT TYPE	DECA/CAREX
Phase	-
Number of Stands	6
Low Shrubs	
Vaccinium scoparium	(17) 1
Graminoids	
Agrostis diegoensis	(17) 4
A. humilis	(17) 1
A. idahoensis	(33) P
A. scabra	(33) 1
Alopecurus pratensis	(33) 3
Carex albanigra	(17) P
C. athrostachya	(33) 14
C. parryana	(50) 10
C. rupestris	(17) 7
C. scopulorum	(33) 6
Danthonia intermedia	(83) 5
Deschampsia caespitosa	(100) 45
Juncus balticus	(17) 1
J. hallii	(33) 3
J. mertensianus	(17) 1
J. parryi	(17) 1
Luzula campestris	(33) P
Phleum alpinum	(83) 2
Poa pratensis	(33) P
Trisetum wolfii	(33) 2
Forbs	
Achillea millefolium	(17) 1
Antennaria corymbosa	(67) 6
Arnica chamissonis	(17) 1
Aster foliaceus	(17) 2
Camasia quamash	(17) 3
Erigeron speciosus	(50) 5
Gentiana affinis	(33) P
Pedicularis groenlandica	(33) P
Polygonum bistortoides	(83) 1
Potentilla arguta	(17) P
P. diversifolia	(33) P
P. gracilis	(83) 1
Rumex paucifolius	(17) P
R. salicifolius	(17) 1
Senecio integerrimus	(17) 3
S. lugens	(33) P
S. wernerifolius	(17) 3
Trifolium spp.	(33) P
Veronica wormskjoldii	(33) 1

Table B6.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the following habitat types within the *Artemisia arbuscula* Series: *ARTEMISIA ARBUSCULA/AGROPYRON SPICATUM* H.T. (ARAR/AGSP), with *STIPA COMATA* Phase (STCO); and *A. ARBUSCULA/FESTUCA IDAHOENSIS* H.T. (ARAR/FEID).

HABITAT TYPE	ARAR/AGSP		ARAR/FEID
Phase	STCO	-	-
Number of Stands	3	3	2
Medium Shrubs			
Artemisia arbuscula	(100) 22	(100) 7	(100) 8
A. tridentata	-	(100) 12	(100) P
Chrysothamnus nauseosus	-	-	(50) P
C. viscidiflorus	-	(33) P	(50) 1
Tetradymia canescens	(33) P	-	(50) 1
Low Shrubs			
Artemisia frigida	(67) 1	-	(100) P
Eurotia lanata	(33) P	-	(50) P
Gutierrezia sarothrae	(67) 4	(33) P	-
Leptodactylon pungens	(33) P	-	-
Opuntia polyacantha	(100) P	(67) P	-
Graminoids			
Agropyron spicatum	(100) 14	(100) 25	(100) 24
Aristida longiseta	(33) P	-	-
Bouteloua gracilis	(67) P	-	-
Carex filifolia	(33) P	(33) P	-
C. pennsylvanica	-	(33) 1	-
C. stenophylla	(33) P	-	(100) P
Festuca idahoensis	-	-	(100) 31
Hesperochloa kingii	-	(33) 10	-
Koeleria cristata	(100) 4	(100) 8	(100) 9
Oryzopsis hymenoides	(67) 1	-	-
Poa cusickii	-	-	(50) 2
P. sandbergii	(100) 1	(100) 2	(50) 3
Stipa comata	(100) 3	-	(50) P
S. occidentalis	-	-	(50) P
Forbs			
Achillea millefolium	-	(33) P	(50) 2
Agoseris glauca	-	-	(50) 1
Allium cernuum	(67) P	(67) P	(100) P
Anaphalis margaritacea	-	-	(50) 1
Androsace septentrionalis	-	-	(50) P
Antennaria rosea	-	(33) P	(100) 12
Arabis holboellii	(33) P	-	(50) P
A. microphylla	-	(67) P	-
Arenaria congesta	-	(67) P	(50) P
Aster scopulorum	-	-	(50) P
Astragalus drummondii	(33) P	-	-
A. platytropis	(33) P	-	-
A. purshii	(67) P	(67) P	-
Besseya wyomingensis	-	-	(50) P
Bupleurum americanum	-	-	(50) P

Table B6. - Page 2

HABITAT TYPE	ARAR/AGSP		ARAR/FEID
Phase	STCO	-	-
Number of Stands	3	3	2
Forbs (continued)			
Castilleja angustifolia	-	(67) 2	-
C. cervina	-	-	(50) P
C. linariaefolia	-	(33) P	-
C. pallescens	-	(33) P	-
Clematis hirsutissima	-	-	(50) 3
Comandra umbellata	(67) P	(33) P	(50) P
Crepis occidentalis	-	(67) 1	(50) P
Cryptantha celosioides	(33) P	-	(50) P
Delphinium occidentale	-	-	(50) P
Descurainia richardsonii	(33) P	-	-
Dodecatheon conjugens	-	-	(50) P
Draba oligosperma	(33) P	-	-
Erigeron caespitosus	-	(67) P	-
E. compositus	-	-	(100) 2
E. corymbosus	-	(37) P	-
E. divergens	-	(33) P	-
E. filifolius	(33) P	-	-
E. ochroleucus	-	(67) P	-
E. tweedyi	(33) P	-	(50) 1
Eriogonum microthecum	(33) P	-	-
E. ovalifolium	(33) P	(33) P	-
E. umbellatum	(33) P	-	-
Frasera speciosa	-	-	(50) 1
Geum triflorum	-	-	(50) P
Haplopappus acaulis	(33) P	(67) P	-
Hymenoxys acaulis	(33) P	(67) P	-
Lesquerella alpina	(67) P	(33) P	(50) P
Lewisia rediviva	-	(33) P	-
Liatris punctata	(33) P	-	-
Linum perenne	(67) P	(100) 1	(100) P
Lithospermum incisum	-	-	(50) P
L. ruderale	(33) P	-	-
Oxytropis sericea	-	-	(50) 7
Paronychia sessiliflora	(33) 1	-	-
Pedicularis contorta	-	-	(50) 1
Penstemon aridus	-	(33) P	-
Phlox albomarginata	(33) P	-	-
P. hoodii	(67) P	(100) 9	(100) 4
P. longifolia	-	-	(50) 1
Potentilla gracilis	-	-	(50) P
P. pensylvanica	-	(33) P	-
Sedum lanceolatum	(33) P	(33) P	(50) P
Senecio canus	(67) P	(33) P	(50) 1
S. pauperculus	-	-	(50) 2
Sphaeralcea coccinea	(33) P	-	-
Taraxacum officinale	-	(33) P	(100) P
Townsendia mensana	-	-	(50) P
T. parryi	-	-	(50) P
Tragopogon dubius	(33) P	-	-

Table B7.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the following habitat types within the *Artemisia tridentata* Series: *ARTEMISIA TRIDENTATA/AGROPYRON SPICATUM* (MONT.) H.T. (ARTR/AGSP); *A. TRIDENTATA/FESTUCA SCABRELLA* H.T. (ARTR/FESC); and *A. TRIDENTATA/FESTUCA IDAHOENSIS* (MONT.) H.T. (ARTR/FEID), with *GERANIUM VISCOSISSIMUM* Phase (GEVI).

HABITAT TYPE	ARTR/AGSP	ARTR/FESC	ARTR/FEID	
Phase	-	-	-	GEVI
Number of Stands	6	6	8	4
Medium Shrubs				
Amelanchier alnifolia	-	(50) P	-	-
Artemisia tridentata	(100) 15	(100) 21	(100) 18	(100) 23
Chrysothamnus nauseosus	(33) P	(17) P	(25) P	-
C. viscidiflorus	(17) P	-	(75) 1	-
Rosa arkansana	-	(50) P	-	-
Tetradymia canescens	(17) P	(17) P	(25) P	-
Low Shrubs				
Arctostaphylos uva-ursi	-	(17) 1	-	-
Artemisia frigida	(83) 2	(33) P	(63) 1	-
Gutierrezia sarothrae	(83) 2	-	(13) P	-
Opuntia polyacantha	(67) P	-	(13) P	-
Graminoids				
Agropyron caninum	-	-	-	(100) 12
A. dasystachyum	-	-	(13) 2	-
A. smithii	-	(17) 1	(13) P	-
A. spicatum	(100) 32	(83) 6	(75) 5	(100) 2
Bouteloua gracilis	(83) 1	(33) P	-	-
Bromus carinatus	-	-	-	(75) 13
B. ciliatus	-	-	(13) 1	-
Calamagrostis rubescens	-	-	-	(50) 2
Carex obtusata	-	-	(25) 2	-
C. petasata	(17) P	(17) 1	(25) 1	(25) P
C. pennsylvanica	-	-	(25) 1	-
C. raynoldsii	-	-	-	(75) 9
C. stenophylla	(50) 1	(17) P	-	(25) P
Danthonia intermedia	-	(33) 2	(38) P	(100) 16
Festuca idahoensis	-	(83) 16	(100) 39	(100) 36
F. scabrella	-	(100) 25	-	-
Koeleria cristata	(83) 5	(100) 1	(88) 4	(100) 3
Poa cusickii	-	(83) P	(25) P	-
P. juncifolia	-	(17) P	-	(100) 6
P. sandbergii	(83) 2	(17) P	(88) 1	-
Stipa comata	(83) 2	-	(38) 1	(25) 2
S. occidentalis	-	-	(38) P	(100) 14
S. richardsonii	-	(17) 3	(25) P	(25) P
Forbs				
Achillea millefolium	(17) P	(100) 1	(75) 1	(100) 8
Agoseris glauca	-	(17) P	(63) 1	(100) 1
Allium cernuum	(67) P	(83) P	(63) P	-
Anaphalis margaritacea	-	(17) P	-	(50) P
Androsace occidentalis	-	-	-	(50) P

Table B7. - Page 2

HABITAT TYPE	ARTR/AGSP		ARTR/FESC		ARTR/FEID			
Phase	-		-		-		GEVI	
Number of Stands	6		6		8		4	
Forbs (continued)								
Androsace septentrionalis	-		-		(25)	P	(25)	P
Anemone patens	-		-		-		(50)	P
Antennaria parvifolia	(17)	P	(17)	P	(13)	2	(75)	1
A. rosea	(33)	P	(83)	4	(75)	4	(25)	P
Arabidopsis thaliana	-		-		(25)	P	(75)	P
Arabis holboellii	(33)	P	(33)	P	(13)	P	-	
Arenaria congesta	(17)	P	(83)	2	(50)	P	(100)	3
Artemisia ludoviciana	-		(50)	1	(13)	P	-	
Aster campestris	-		-		-		(75)	2
A. falcatus	-		(50)	P	-		-	
Astragalus drummondii	(17)	P	(17)	P	(25)	1	-	
A. miser	-		(17)	2	(25)	1	(75)	2
A. purshii	(33)	P	(33)	P	(13)	P	-	
Balsamorhiza sagittata	-		(33)	P	(13)	P	(50)	P
Besseya wyomingensis	-		-		(50)	P	-	
Campanula rotundifolia	-		(50)	P	(13)	P	(100)	1
Cerastium arvense	-		(67)	1	(25)	1	(50)	2
Chrysopsis villosa	(17)	P	(17)	P	(50)	1	-	
Clematis hirsutissima	-		(33)	P	(13)	1	(25)	P
Collomia linearis	-		(17)	P	-		(100)	P
Comandra umbellata	(17)	P	(50)	P	(50)	P	-	
Crepis occidentalis	(50)	P	(33)	P	(13)	P	-	
Cymopterus bipinnatus	-		-		(25)	1	-	
Delphinium bicolor	-		-		(25)	P	-	
Dodecatheon conjugens	-		-		(38)	P	(100)	P
Erigeron caespitosus	(50)	P	(33)	1	(13)	P	-	
E. compositus	(50)	P	(33)	P	(50)	1	-	
E. filifolius	(33)	P	(17)	P	-		-	
Eriogonum umbellatum	(17)	P	(67)	1	(38)	P	(100)	10
Erysimum asperum	-		-		-		(75)	P
Fragaria virginiana	-		(33)	P	-		(25)	P
Geranium viscosissimum	-		(33)	P	-		(100)	5
Geum triflorum	(17)	P	(17)	1	(75)	2	(100)	10
Haplopappus acaulis	(17)	P	-		(38)	1	-	
Helianthella uniflora	-		-		-		(100)	7
Heuchera cylindrica	-		-		(25)	P	-	
Lesquerella alpina	-		(50)	P	(13)	P	-	
Linum perenne	(17)	P	(50)	P	(13)	P	(75)	1
Lithospermum ruderale	(33)	P	(33)	P	(25)	P	-	
Lomatium triternatum	(17)	P	(17)	P	-		(75)	1
Lupinus sericeus	(33)	1	(50)	2	(50)	3	(25)	P
L. wyethia	-		-		-		(75)	1
Mertensia obligifolia	-		-		(25)	P	-	
Oxytropis riparia	(33)	1	-		-		-	
O. sericea	(33)	P	-		(13)	P	-	
Phlox hoodii	(33)	1	(67)	P	(50)	2	-	
P. longifolia	-		(17)	P	(13)	P	(50)	3
P. multiflora	-		-		(50)	P	(25)	2
Polygonum douglasii	-		-		-		(75)	1

Table B7. - Page 3

HABITAT TYPE	ARTR/AGSP	ARTR/FESC	ARTR/FEID	
Phase	-	-	-	GEVI
Number of Stands	6	6	8	4
Forbs (continued)				
Potentilla arguta	-	(17) P	(13) P	(75) 4
P. glandulosa	-	-	-	(25) 1
P. gracilis	-	(50) 1	-	(100) 3
P. pensylvanica	(17) P	(33) P	(13) P	-
Sedum lanceolatum	-	-	(63) P	-
Senecio canus	(33) P	(33) P	(38) P	-
Silene parryii	-	-	(13) 1	(75) P
Taraxacum officinale	(17) P	(67) P	(75) P	(50) P
Tragopogon dubius	(50) P	(67) P	(38) P	-
Vicia americana	-	(33) P	-	(25) P
Zigadenus venenosus	-	-	(38) P	(25) P

Table B8.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important species within the *ARTEMISIA TRIPARTITA/FESTUCA IDAHOENSIS* H.T. (MONT.) (ARTRI/FEID).

HABITAT TYPE	ARTRI/FEID
Phase	-
Number of Stands	5
Medium Shrubs	
Artemisia tridentata	(60) 1
A. tripartita	(100) 12
Chrysothamnus viscidiflorus	(100) 4
Tetradymia canescens	(80) 3
Low Shrubs	
Artemisia frigida	(80) 1
Gutierrezia sarothrae	(40) P
Graminoids	
Agropyron caninum	(60) 7
A. dasystachyum	(60) 7
A. spicatum	(20) 7
Calamagrostis montanensis	(100) 8
Carex stenophylla	(80) 1
Festuca idahoensis	(100) 56
Koeleria cristata	(100) 5
Poa cusickii	(60) 5
P. sandbergii	(40) 1
Stipa comata	(20) 10
Forbs	
Achillea millefolium	(100) P
Agoseris glauca	(40) P
Androsace septentrionalis	(40) P
Antennaria rosea	(60) 2
Arabidopsis thaliana	(40) P
Comandra umbellata	(40) 1
Erigeron compositus	(60) P
Eriogonum umbellatum	(60) P
Geum triflorum	(40) P
Lepidium spp.	(40) P
Lupinus sericeus	(60) 13
Phlox hoodii	(100) 5
Sedum lanceolatum	(40) P
Taraxacum officinale	(80) 1
Tragopogon dubius	(40) P

Table B9.--General reconnaissance data of canopy cover (+ = <1%, * = 1-10%, ** = 10-20%, *** = >20%) in the *ARTEMISIA PEDATIFIDA/FESTUCA IDAHOENSIS* H.T. (ARPE/FEID).

HABITAT TYPE	ARPE/FEID
Phase	-
Number of Stands	2
Medium Shrubs	
Chrysothamnus nauseosus	*
C. viscidiflorus	*
Tetradymia canescens	+
Low Shrubs	
Artemisia frigida	*
A. pedatifida	***
Graminoids	
Agropyron dasystachyum	*
A. spicatum	*
Calamagrostis montanensis	*
Festuca idahoensis	**
Koeleria cristata	*
Poa sandbergii	**
Forbs	
Antennaria rosea	*
Arenaria congestis	*
Erigeron caespitosus	+
Phlox hoodii	*
Senecio cana	+

Table B10.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the following habitat types within the *Potentilla fruticosa* Series: *POTENTILLA FRUTICOSA/FESTUCA SCABRELLA* H.T. (POFR/FESC), with *DANTHONIA INTERMEDIA* Phase (DAIN); and in the *P. FRUTICOSA/FESTUCA IDAHOENSIS* H.T. (POFR/FEID).

HABITAT TYPE	POFR/FESC		POFR/FEID
Phase	-	DAIN	-
Number of Stands	5	6	4
Medium Shrubs			
Potentilla fruticosa	(100) 13	(100) 14	(100) 10
Rosa arkansana	(20) P	(50) 1	-
Rosa woodsii	(20) P	(17) P	-
Low Shrubs			
Arctostaphylos uva-ursi	(20) 1	(67) 11	-
Artemisia frigida	(100) 2	-	-
A. campestris	(60) 1	-	-
Gutierrezia sarothrae	(80) P	-	-
Juniperus horizontalis	(20) P	(33) 1	-
Graminoids			
Agropyron caninum	(20) P	(100) 2	(50) 2
A. dasystachyum	(20) 1	(33) 1	-
A. smithii	(20) 1	-	-
A. spicatum	(80) 9	(17) P	(25) P
Agrostis scabra	-	(33) P	(50) 1
Bouteloua gracilis	(40) 1	-	-
Bromus carinatus	-	(33) P	-
B. ciliatus	-	(17) P	-
Calamagrostis purpurascens	-	(17) P	(75) 1
Calamovilfa longifolia	(40) P	-	-
Carex filifolia	(40) 1	(17) P	(25) 4
C. hoodii	-	(17) P	-
C. obtusata	(40) P	(67) 6	(75) 8
C. parryana	-	-	(25) 3
C. pennsylvanica	(20) P	(33) P	-
C. petasata	-	(67) 1	(25) P
C. practicola	-	-	(25) 1
C. raynoldsii	-	(17) 1	-
C. scirpoidea	(80) 5	-	-
C. stenophylla	(20) P	(17) 1	(25) 4
C. vallicola	-	(17) P	-
Danthonia intermedia	-	(100) 5	(75) 18
D. parryi	(40) 13	-	-
Festuca idahoensis	(80) 5	(100) 16	(100) 40
F. scabrella	(100) 17	(100) 48	(25) P
Helictotrichon hookeri	(60) P	(83) P	(50) P
Koeleria cristata	(100) 4	(100) 1	(75) 1
Luzula spicata	-	-	(50) 1
Muhlenbergia cuspidata	(60) P	-	-
M. richardsonis	(80) 1	-	-
Phleum pratense	(60) P	(67) 2	-
Poa grayana	-	-	(25) P
P. interior	-	(17) P	(25) 2
P. juncifolia	-	-	(25) 2

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HABITAT TYPE	POFR/FESC				POFR/FEID	
Phase	-		DAIN		-	
Number of Stands	5		6		4	
Graminoids (continued)						
Poa nevadensis	-		-		(25)	1
P. pratensis	(60)	P	(83)	6	(25)	P
P. rupicola	-		-		(25)	1
P. sandbergii	(40)	1	(17)	P	-	
Stipa occidentalis	(40)	P	(33)	P	(25)	P
S. richardsonii	(40)	1	-		(25)	2
S. viridula	-		(33)	P	-	
Forbs						
Achillea millefolium	(100)	1	(100)	2	(100)	5
Agoseris glauca	(60)	P	(100)	3	(75)	3
Allium cernuum	(100)	1	(67)	P	(50)	1
Anaphalis margaritacea	-		(33)	P	(25)	1
Anemone multifida	(20)	P	(33)	P	(25)	P
A. patens	(60)	P	(67)	P	-	
Antennaria anaphaloides	-		(33)	P	(25)	1
A. parvifolia	(80)	2	(17)	P	(25)	P
A. rosea	(20)	P	(50)	P	(75)	1
Arabis holboellii	(40)	P	-		-	
Arenaria congesta	(40)	P	(67)	P	(100)	3
Arnica fulgens	-		(17)	P	(25)	P
A. sororia	-		(33)	P	-	
Artemisia ludoviciana	-		(33)	P	-	
Aster integrifolius	(60)	P	(33)	P	-	
Astragalus miser	-		(17)	P	(25)	P
A. purshii	(40)	P	-		-	
Besseya wyomingensis	(20)	P	(67)	P	(100)	4
Bupleurum americanum	(20)	P	(67)	P	(25)	P
Campanula rotundifolia	(80)	1	(100)	1	(100)	2
Cerastium arvense	(60)	1	(100)	2	(75)	4
Chrysopsis villosa	(80)	1	(33)	P	-	
Clematis hirsutissima	-		(33)	P	(25)	P
Comandra umbellata	(60)	P	(17)	P	-	
Cryptantha celosioides	(20)	P	-		(25)	P
Dodecatheon conjugens	(20)	P	(100)	P	(75)	P
Douglasia montana	-		-		(50)	P
Erigeron caespitosus	(60)	1	-		(50)	P
E. compositus	(40)	P	-		-	
E. corymbosus	(20)	P	(17)	P	-	
E. filifolia	(20)	P	-		(25)	1
E. simplex	-		-		(25)	P
E. speciosus	-		(50)	3	-	
Eriogonum umbellatum	(20)	P	(17)	P	(25)	P
Fragaria virginiana	(20)	P	(83)	P	-	
Frasera speciosa	(40)	P	(17)	P	(75)	1
Gaillardia aristata	(100)	2	(83)	P	(25)	P
Galium boreale	(100)	3	(100)	3	(50)	2
Gentiana affinis	(20)	P	-		(25)	2
Geranium viscosissimum	-		(50)	1	-	

Table B10. - Page 3

HABITAT TYPE	POFR/FESC		POFR/FEID
Phase	-	DAIN	-
Number of Stands	5	6	4
Forbs (continued)			
Geum triflorum	(60) P	(50) 2	(75) 6
Haplopappus acaulis	(40) P	-	-
Hedysarum spp.	(40) P	(67) 1	-
Heuchera spp.	-	-	(75) P
Hymenoxys acaulis	(40) P	-	-
Iris missouriensis	(40) P	(33) P	-
Lesquerella alpina	(40) P	-	-
Liatris punctata	(40) P	-	-
Linum perenne	(80) 1	(33) P	-
Lithospermum ruderale	-	(50) P	-
Lupinus sericeus	(20) P	(67) 7	(25) 1
Lupinus spp.	-	(17) P	(25) 1
Lychnis drummondii	-	-	(25) P
Monarda fistulosa	-	(50) 1	-
Oxytropis campestris	-	(17) P	(25) P
O. sericea	(80) 1	(17) P	(25) P
O. viscida	(20) 1	-	-
Pedicularis contorta	-	-	(25) 1
Penstemon eriantherus	(40) 1	-	-
P. procerus	-	(33) P	(50) 1
Petalostemon purpureum	(60) P	-	-
Phlox hoodii	(40) P	(33) 2	(25) 1
P. kelseyi	(40) 3	-	-
P. muscoides	(40) P	-	-
P. pulvinata	-	-	(25) 2
Plantago tweedyi	(40) 1	-	-
Polygonum bistortoides	-	(33) P	(75) 1
Potentilla gracilis	(20) P	(83) 3	(100) 2
P. hippiana	(40) P	(33) P	-
Sedum lanceolatum	-	(17) P	(100) 1
Senecio canus	(100) 2	(17) P	-
S. megacephalus	(40) 1	-	(25) 1
Solidago missouriensis	(100) 1	(83) 1	(25) P
Taraxacum officinale	(40) P	(50) 1	(50) P
Thermopsis rhombifolia	(40) P	-	-
Tragopogon dubius	(60) P	(33) P	-
Trifolium spp.	-	(17) P	(25) 3
Vicia americana	(20) P	(50) P	-
Viola adunca	(40) 1	-	-
Zigadenus elegans	-	-	(50) 1
Z. venenosus	(20) P	(33) P	-

Table B11.--General reconnaissance data (G) of canopy cover (+ = <1%, * = 1-10%, ** = 10-20%, *** = >20%), and intensive plot data (I) of percent constancy and average canopy cover of important plants in the following habitat types within the *Purshia tridentata* Series: *PURSHIA TRIDENTATA/AGROPYRON SPICATUM* (MONT.) H.T. (PUTR/AGSP); *P. TRIDENTATA/FESTUCA SCABRELLA* H.T. (PUTR/FESC); and *P. TRIDENTATA/FESTUCA IDAHOENSIS* H.T. (MONT.) (PUTR/FEID).

HABITAT TYPE	PUTR/AGSP		PUTR/FESC	PUTR/FEID
Phase	-	-	-	-
Number of Stands	1	4	4	1
Data Source	I	G	I	G
Medium Shrubs				
Chrysothamnus nauseosus	2	+	(25) P	
C. viscidiflorus	1	+	(25) P	
Purshia tridentata	P	**	(100) 17	***
Rosa arkansana		+	(25) 1	+
Low Shrubs				
Artemisia frigida		*	(25) P	+
A. dracunculus	P			
Graminoids				
Agropyron spicatum	58	**	(100) 35	**
Aristida longiseta			(25) P	
Bromus mollis			(50) P	
B. tectorum	2	*	(75) 8	+
Festuca idahoensis			(100) 19	*
F. octoflora			(75) 1	
F. scabrella			(100) 7	
Koeleria cristata	P	+	(100) 2	*
Poa sandbergii		+	(100) 5	*
Stipa comata		*	(25) 1	
S. occidentalis			(25) P	
S. viridula		+		*
Forbs				
Achillea millefolium	2	+	(100) 2	
Antennaria rosea		+	(50) P	+
Arabis holboellii	P		(25) P	
Arenaria congesta			(25) P	*
Arnica sororia			(50) P	
Arabidopsis thaliana			(50) P	
Balsamorhiza sagittata	12	*	(75) 10	
Centaurea maculosa		+		
Chaenactis douglasii	1			
Chrysopsis villosa	P	+	(25) 1	+
Collinsia parviflora			(100) 1	
Collomia linearis			(50) P	
Comandra umbellata			(50) P	
Crepis spp.		+	(75) P	
Epilobium minutum			(75) P	
Erigeron corymbosus			(25) 3	
E. subtrinervis			(25) P	
Eriogonum microthecum			(25) P	
E. umbellatum			(25) P	*

Table B11. - Page 2

HABITAT TYPE	PUTR/AGSP		PUTR/FESC		PUTR/FEID
Phase	-	-	-		-
Number of Stands	1	4	4		1
Data Source	I	G	I		G
Forbs (continued)					
Hieracium albertinum			(50)	1	
Lepidium spp.			(50)	1	
Lithospermum ruderale		+	(75)	P	
Lomatium triternatum			(75)	P	
Lupinus serecius		+	(50)	1	*
Medicago spp.	1		(25)	P	
Myosotis micrantha			(25)	P	
Oxytropis spp.		+			+
Penstemon diphyllus	1				
Phacelia linearis	P		(75)	P	
Phlox spp.	2		(25)	P	
P. longifolia		+			+
P. hoodii					*
Physaria geyeri	1				
Stellaria spp.			(25)	2	
Taraxacum officinale			(50)	P	
Tragopogon dubius	P	+	(100)	2	+

Table B12.--Intensive plot data (I) of percent constancy and average canopy cover, and general reconnaissance data (G) of canopy cover (+ = <1%, * = 1-10%, ** = 10-20%, *** = >20%) of important plants within the *CERCOCARPUS LEDIFOLIUS/ AGROPYRON SPICATUM* H.T. (CELE/AGSP).

HABITAT TYPE	CELE/AGSP	
Phase	-	
Number of Stands	1	2
Data Source	I	G
Medium and Tall Shrubs		
Artemisia arbuscula	P	
A. tridentata		*
Cercocarpus ledifolius	19	**
Chrysothamnus nauseosus		+
Juniperus scopulorum	P	
Rhus trilobata		+
Low Shrubs		
Artemisia frigida	2	*
Eurotia lanata		+
Gutierrezia sarothrae	7	*
Opuntia polyacantha	P	
Graminoids		
Agropyron spicatum	9	**
Aristida longiseta	P	
Bouteloua gracilis	P	
Carex filifolia	1	
C. stenophylla	P	
Koeleria cristata	1	*
Oryzopsis hymenoides		*
Poa sandbergii	P	
Stipa comata	7	*
Forbs		
Allium cernuum	P	
Antennaria rosea		+
Comandra umbellata	P	
Draba oligosperma	P	
Erigeron caespitosa		*
Eriogonum microthecum		+
E. umbellatum	P	
Happlopappus acaulis		*
Lesquerella alpine	P	
Linum perenne	P	
Lithospermum ruderale		+
Mamillaria missouriensis	P	
Petrophytum caespitosum	P	
Phlox albomarginata	1	
P. hoodii		*

Table B13.--(Percent constancy) and average canopy cover in percent (P = <.5% cover) of important plants in the *RHUS TRILOBATA/AGROPYRON SPICATUM* H.T. (RHTR/AGSP), and in the *R. TRILOBATA/FESTUCA IDAHOENSIS* H.T. (RHTR/FEID).

HABITAT TYPE	RHTR/AGSP	RHTR/FEID
Phase	-	-
Number of Stands	4	1
Medium Shrubs		
Amelanchier alnifolia	(25) P	-
Artemisia tridentata	(25) P	-
Chrysothamnus nauseosus	(75) P	-
C. viscidiflorus	(25) P	-
Juniperus scopulorum	(25) P	-
Prunus virginiana	(50) 1	-
Rhus trilobata	(100) 23	14
Ribes cereum	(25) 1	-
Rosa arkansana	-	P
Low Shrubs		
Artemisia campestris	(25) P	P
A. dracunculus	(25) P	-
A. frigida	(75) 1	3
Juniperus horizontalis	-	P
Opuntia polyacantha	(100) P	-
Graminoids		
Agropyron smithii	(25) 1	-
A. spicatum	(100) 41	18
Aristida longiseta	-	1
Bouteloua gracilis	-	4
Bromus tectorum	(100) 4	P
Calamagrostis montanensis	-	P
Carex pennsylvanica	-	3
Festuca idahoensis	-	6
Koeleria cristata	(25) P	1
Muhlenbergia cuspidata	-	1
Oryzopsis hymenoides	(25) 5	-
Poa pratensis	-	3
P. sandbergii	(25) P	-
Stipa comata	-	4
S. viridula	(25) P	P
Forbs		
Achillea millefolium	(75) P	3
Allium cernuum	-	1
Antennaria parvifolia	-	1
Aster falcatus	(25) P	-
Astragalus drummondii	(25) P	-
Besseya wyomingensis	(25) P	1
Cerastium arvense	-	2
Chaenactis douglasii	(25) P	-
Chrysopsis villosa	(75) 1	9
Cirsium undulatum	(75) P	P

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HABITAT TYPE	RHTR/AGSP		RHTR/FEID
Phase	-		-
Number of Stands	4		1
Forbs (continued)			
Comandra umbellata	(25)	P	P
Erigeron caespitosus	-		P
E. pumilis	(25)	P	-
Erysimum inconspicuum	(25)	P	-
Gaillardia aristata	-		1
Gaura coccinea	(50)	P	P
Geum triflorum	-		1
Haplopappus acaulis	(25)	P	-
H. nuttallii	(25)	P	-
Lepidium spp.	-		P
Liatris punctata	(25)	P	1
Linum perenne	(25)	P	P
Melilotus officinalis	(50)	1	-
Mentzelia dispersa	(50)	P	-
Petalostemon purpureum	(25)	P	1
Phlox albomarginata	(25)	P	-
P. hoodii	(25)	P	2
Plantago purshii	-		P
Potentilla arguta	-		P
P. hippeana	-		P
Psoralea tenuiflora	(50)	1	-
Ratibida columnifera	-		P
Senecio canus	(25)	P	-
Solidago missouriensis	-		P
Sphaeralcea coccinea	(75)	P	-
Taraxacum officinale	-		P
Thermopsis rhombifolia	-		P
Tragopogon dubius	(50)	1	P
Vicia americana	(75)	2	-

Table B14.--Intensive plot data (I) of average canopy cover, and general reconnaissance data of canopy cover (+ = <.1%, * = 1-10%, ** = 10-20%, *** = >20%) for important plants in the *SARCOBATUS VERMICULATUS/AGROPYRON SMITHII* H.T. (SAVE/AGSM), and *S. VERMICULATUS/ELYMUS CINEREUS* H.T. (SAVE/ELCI).

HABITAT TYPE	SAVE/AGSM		SAVE/ELCI
Phase	-		-
Number of Stands	1	2	2
Data Source	I	G	G
Medium Shrubs			
Atriplex nuttallii	5	+	
Chrysothamnus viscidiflorus		+	*
Sarcobatus vermiculatus	3	**	**
Low Shrubs			
Artemisia frigida		*	*
Gutierrezia sorathrae			*
Opuntia polyacantha		*	*
Graminoids			
Agropyron smithii	55	**	**
A. spicatum			*
Bouteloua gracilis		**	
Bromus tectorum		+	
Carex filifolia			+
Elymus cinereus			*
Koeleria cristata			*
Poa juncifolia	2		
P. pratensis			+
Stipa comata		*	
S. viridula		+	
Forbs			
Aster chilensis			+
Chenopodium spp.		+	
Comandra umbellata			+
Iva axillaris			+
Tragopogon dubius		+	+
Sphaeralcea coccinea			+

APPENDIX C.--COMPARISONS OF DIFFERENTIALLY-GRAZED PAIRED STANDS

Table C1.--Diffentially-grazed paired stands in the *Stipa comata* SERIES:[1/] canopy-cover percent with confidence levels (** = >99%, * = 95 to 98%, and + = 90 to 94% probability of means differing statistically).

HABITAT TYPE:	*STCO/BOGR*		*STCO/BOGR AGSM-AGDA* phase		
STAND NO.:	102	103	167		168
GRAZING:	None	Heavy	Slight		Moderate
COVER CLASS					
Shrubs	3.8	5.2	8.3	*	13.4
Graminoids	61.3	57.8	72.6	**	60.2
Forbs	0.2	0.2	11.1		8.6
Bryophytes	10.8	* 6.8	14.1	+	16.1
Bare Ground	19.2	23.1	5.0	**	16.1
Litter	2.7	3.4	69.8	**	48.2
Rock	7.1	5.1	13.7	**	1.1
SHRUBS					
Artemisia frigida	P		7.6	+	10.1
Chrysothamnus nauseosus					1.9
Gutierrezia sarothrae	P	0.8	0.8		0.7
Eurotia lanata	P	P			0.4
Opuntia polyacantha	3.8	4.4			0.8
GRAMINOIDS					
Agropyron smithii			3.5	+	1.6
A. spicatum			0.4		0.1
Bouteloua gracilis	53.9	54.7	8.9	**	22.6
Calamagrostis montanensis			4.3	**	9.7
Carex filifolia			20.0	**	9.0
C. stenophylla	10.3	9.2	1.0	**	4.0
Koeleria cristata			6.6	**	0.6
Poa sandbergii			P	+	0.8
Sitanion hysterix	0.4				
Stipa comata	9.6	* 3.3	29.3	**	7.6
FORBS					
Astragalus ceramicus			0.4		P
A. drummondii			1.7		1.4
A. purshii	0.1	0.1	0.1		
Hymenoxys acaulis			0.6		
Liatris punctata			0.1		
Lygodesmia juncea			0.5		
Melilotus officinalis			0.1	*	0.5
Paronychia sessiliflora			5.8		3.8
Phlox hoodii			2.5	+	0.8
Sphaeralcia coccinea	P	0.2	P	**	2.2
Thelesperma marginatum			0.6	*	0.1

[1/] See the narrative on the *Stipa* Series in the Species Composition Changes section for the location and history of these stands.

Table C2.--Differentially-grazed paired stands in the *Agropyron spicatum* SERIES:[1/] canopy-cover percent with confidence levels (** = >99%, * = 95-98%, and + = 90-94% probability of values differing statistically).

HABITAT TYPE:	*AGSP/BOGR*		*AGSP/BOGR*		*AGSP/BOGR*		*AGSP/AGSM-AGDA*	
STAND NO:	107	108	16	17	13	12	194	195
GRAZING:	None	Moderate	None	Heavy	Moderate	Heavy	None	Moderate
COVER CLASS								
Shrubs	3.5**	14.6	1.8	1.6	P	0.4	23.1**	10.0
Graminoids	44.6 *	36.5	40.7	39.6	68.0**	45.7	76.2**	56.0
Forbs	P	0.7	12.8	10.6	19.1	15.3	28.4**	65.7
Bryophytes	25.6	24.9	4.5		21.6	17.7	11.7 *	1.4
Bare Ground	18.3	16.2	30.0 *	42.1	1.6**	5.8	1.4**	6.3
Litter	21.8 +	16.3	17.4 *	11.6	22.1 +	27.5	76.4**	63.7
Rock	6.8**	17.9	1.6	1.8	3.2	4.5	8.9**	14.7
SHRUBS								
Artemisia frigida	2.5	4.5	8.2	6.8	0.9 *	3.2	15.6**	3.4
Artemisia tridentata			P	0.9				
Chrysothamnus nauseosus			P	0.4		0.4		
C. viscidiflorus			0.8	0.1				
Gutierrezia sarothrae	P**	4.4	1.2	2.0	P	0.9	10.5**	1.4
Juniperus horizontalis								3.2
Leptodactylon pungens				0.4				
Opuntia polyacantha			1.0	0.1				
Potentilla fruticosa							P	2.1
Rosa arkansana		0.4						0.1
GRAMINOIDS								
Agropyron dasystachyum							22.0**	10.4
A. spicatum	25.9**	6.1	16.2**	3.4	14.6**	1.7	3.3 +	0.8
Bouteloua gracilis	10.9	13.8	9.5**	22.8	10.7**	4.5		
Bromus tectorum						2.6		
Calamagrostis montanensis					0.1 +	1.1	2.3 *	0.5
Carex filifolia							4.6	5.4
C. stenophylla	3.9 *	6.7	1.7 *	3.8	0.7	1.2	1.4	2.5
Helictotrichon hookeri								**13.7
Koeleria cristata			0.1	0.4	15.7**	0.8	8.1	10.2
Muhlenbergia cuspidata								0.4
Poa cusickii							6.6	7.5
P. pratensis						1.9		
P. sandbergii	3.0	4.3	2.3 *	5.1	2.6	2.9		
Stipa comata	7.2 *	12.7	13.8	9.8	18.2**	30.2	9.9**	0.2
S. viridula							25.7**	

[1/] See the narrative on the *Agropyron spicatum* Series in the Species Composition Changes section for the location and history of these stands.

Table C2 - Page 2

HABITAT TYPE:	*AGSP/BOGR*		*AGSP/BOGR*		*AGSP/BOGR*		*AGSP/AGSM-AGDA*	
STAND NO:	107	108	16	17	13	12	194	195
GRAZING:	None	Moderate	None	Heavy	Moderate	Heavy	None	Moderate
FORBS								
Achillea millefolium							0.4	0.1
Antennaria rosea					0.2	P		
Astragalus purshii							0.2	0.1
Aster falcatus							3.4	1.9
Cerastium arvense							2.5	1.6
Chrysopsis villosa			0.4		0.2 *	2.2	0.1	P
Clematis hirsutissima							P	0.2
Comandra umbellata							2.3	2.4
Cryptantha celosioides							0.1	0.2
Cynoglossum officinale							0.9	
Erigeron caespitosus					0.2	0.2	0.7	1.0
E. divergens			0.2	0.2				
E. filifolius			P				0.1**	2.5
Eriogonum umbellatum							P	0.6
Eritrichum howardii							*	1.8
Galium boreale							1.2**	6.3
Grindelia nana			0.1					
G. squarrosa						0.6	P	
Hymenoxys acaulis							3.9**	9.0
Hymenopappus filifolius								2.3
Lesquerella alpina							1.6**	5.8
Lithospermum incisum					0.1	0.4		
Liatris punctata					4.5**	0.1	0.1	P
Lygodesmia juncea			1.0 *					
Linum perenne							1.3	1.1
Oxytropis riparia					15.0**	5.2		
Paronychia sessiliflora							3.9 *	7.4
Phlox alyssifolia							2.1 +	4.2
P. hoodii	P	0.2	1.0	0.8	1.8**	0.2	7.4 *	12.8
Plantago purshii	**	0.2			**	0.2		
Potentilla pensylvanica					**	0.5	0.1	0.2
Senecio canus								1.2
Sphaeralcea coccinea	P **	0.1	0.9	0.9	P	0.6		
Taraxacum officinale					P **	1.6	1.0 *	
Tragopogon dubius					*	0.4	1.2 +	

Table C3.--Differentially-grazed paired stands in the *Festuca scabrella* SERIES:[1] canopy-cover percent with confidence levels (** = >99%, * = 95-98%, and + = 90-94% probability of means differing statistically).

HABITAT TYPE:	*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*	
STAND NO:	232	233	87	88	366	367	330	331	337	338
GRAZING:	Slight	Moderate	Slight	Moderate	Slight	Heavy	None	Moderate	Slight	Heavy
COVER CLASS										
Shrubs	1.1**	8.7	2.4 +	6.2	9.3	7.9	4.7	2.0	1.2	0.4
Graminoids	91.0**	66.2	53.7**	39.1	68.4**	49.4	70.5**	52.8	81.7**	64.7
Forbs	11.8	14.6	15.5**	38.4	26.0	25.0	15.0	16.2	12.3**	40.4
Bryophytes	18.8**	11.0	10.3**	2.6	16.8**	9.3	0.3	1.8	16.2	16.4
Bare Ground	1.0**	10.4	8.0	9.7	2.0**	8.0	1.3**	13.4		
Litter	85.9**	71.9	40.4 *	47.6	73.4**	43.8	84.6**	45.5	88.3	88.4
Rock	0.5**	5.8	1.0	1.8	3.8**	15.4	P +	0.7		
SHRUBS										
Artemisia cana			2.0 *		0.4	0.1			0.4	
A. dracunculus							0.9	0.1		
A. frigida	1.1 *	3.4	0.4	1.4	8.7	7.1	3.8	1.6	0.1	0.5
Chrysothamnus nauseosus			P *	1.7						
C. viscidiflorus			P	0.1						
Gutierrezia sarothrae	**	4.6	P	0.1		0.2			P	0.1
Rosa arkansana					0.2	0.1			0.5	P
Tetradymia canescens			0.1	2.4						
GRAMINOIDS										
Agropyron smithii	3.6**				5.4**	2.0				
A. spicatum	2.6	4.9	4.2	4.3	14.0**	1.8	11.1	15.7	*	1.2
Bouteloua gracilis	0.6 +	2.2			1.1**	5.4	0.1 *	5.7		
Calamagrostis montanensis					0.4	0.2				
Carex filifolia					4.4	3.6				
C. pennsylvanica									2.4**	14.6
C. obtusata										0.8
C. stenophylla	2.0	1.7	2.1 *	0.2	1.3	0.8	**	5.8		
Danthonia unispicata				0.2						
Festuca idahoensis	36.9**	8.2	21.4**	32.1			11.9**	4.1		
F. scabrella	73.9**	33.6	27.0**	1.4	21.3**	4.7	48.8**	7.0	81.1**	32.4
Koeleria cristata	0.5**	8.8	4.1	4.4	5.6**	15.2	0.4**	6.4	0.2 *	1.5
Muhlenbergia cuspidata					3.1 +	5.8				
Poa cusickii			0.5	0.1	0.2		P	0.4	0.5 +	0.2
P. sandbergii		3.8	0.5	0.4						
Stipa comata					4.1	2.3	0.8	1.2		
S. spartea									1.0**	5.4

[1] See the narrative on the *Festuca scabrella* Series in the Species Composition Changes section for the location and history of these stands.

Table C3 - Page 2

HABITAT TYPE:	*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*		*FESC/AGSP*	
STAND NO:	232	233	87	88	366	367	330	331	337	338
GRAZING:	Slight	Moderate	Slight	Moderate	Slight	Heavy	None	Moderate	Slight	Heavy
FORBS										
Achillea millefolium	1.4 *	P	P	0.6			1.5		1.6	1.8
Agoseris glauca					0.5		P **	0.5		
Allium cernuum	0.2			0.2			1.0	0.2		
Antennaria parvifolia		2.4				0.2				
A. rosea	1.7 *	0.4	0.6	1.0			1.8	1.8	P	1.4
Arabis holboellii				0.4						
A. lignifera	0.2	0.5								
Arenaria congesta	1.1**	6.7	0.1	0.4						
Arnica fulgens	1.0	0.3								
A. sororia							1.4	1.4		
Artemisia ludoviciana	0.4	P					P	0.1	6.0**	15.6
Aster falcatus			0.4	P	1.4	0.8			1.3 +	3.4
Astragalus drummondii				1.6			1.0	0.1		
Balsamorhiza incana	1.5 *	P								
Besseya wyomingensis		0.6								
Cerastium arvense					1.6 +	0.5	0.1		0.2	0.9
Chrysopsis villosa	2.8 *	0.8	1.1	2.3	0.4	0.1	P	0.1	0.6 +	2.4
Cirsium vulgare			P +	1.0						
Comandra umbellata					0.8	1.0		0.2	+	1.0
Crepis acuminata							0.1	0.7		
Erigeron caespitosa					0.2	0.1				
E. corymbosus									0.8	0.2
E. compositus			P	0.4						
E. filifolius						0.2				
Eriogonum umbellatum										
Gaillardia aristata					0.6	0.2				
Gaura coccinea	0.8	P	P **	1.8	0.1		0.1	0.1		
Geum triflorum	P	0.4							0.2**	10.5
Hymenoxys acaulis					2.0	3.2				
Liatris punctata					8.4**	2.8	P	0.2	0.2	0.6
Lithospermum ruderale	0.1	0.1	0.4	0.1			0.4	0.1		
Lomatium spp.							0.6	1.5		
Lupinus serecius			8.8**	28.8			7.7 +	3.0	0.1	
Lygodesmia juncea					0.1					
Oxytropis lambertii			1.9 *							
O. serecia					0.8	1.5				
Paronychia sessiliflora					0.3	1.6				
Petalostemon purpureum					0.2	0.4				
Phlox albomarginata					1.4 *	6.6				
P. longifolia			1.0	1.1						
P. hoodii					1.4**	8.5	0.1	1.3	0.2	0.2
Potentilla pensylvanica	P	0.1								
Senecio cana					0.1	0.2				
Solidago missouriensis	+	0.2	0.3**	2.0	1.6	0.6			0.1	0.1
Sphaeralcea coccinea	**	0.8	0.1	0.2						
Taraxacum officinale	0.3 *		0.1	0.2						
Thelesperma marginatum				1.9	0.5**					
Tragopogon dubius			0.1 *		0.2		0.1	0.2		
Vicia americana	0.1	0.2			P				0.1 *	1.4
Zigadenus venenosus							0.2	0.1		

Table C3 - (Continued) - *F. scabrella* SERIES

HABITAT TYPE:	*FESC/FEID*		*FESC/FEID GEVI* Phase		*FESC/FEID GEVI* Phase	
STAND NO:	198	199	37	38	241	242
GRAZING:	None	Heavy	None	Moderate	None	Heavy
COVER CLASS						
Shrubs	P	0.9			0.1	0.1
Graminoids	82.5**	75.4	60.9	67.4	71.5**	38.4
Forbs	17.5	19.9	48.4	54.4	68.4**	49.9
Bryophytes	44.5**	9.7	0.4	0.3	63.4**	90.4
Bare Ground	P *	0.4	3.7	2.7	0.4	0.3
Litter	83.8	84.4	29.3	29.6	81.1**	59.6
Rock			4.6 +	2.3	1.4 *	0.3
SHRUBS						
Artemisia tridentata	P	0.9				
GRAMINOIDS						
Agropyron dasystachyum	0.1	0.8				
A. spicatum			P	0.8	18.4**	2.2
Carex obtusata			2.7**	8.1		
C. petasata			1.0**	3.4	2.0	0.6
C. vallicola	21.0**	0.2				
Danthonia intermedia				0.6	P	1.7
D. unispicata	0.2**	40.8		0.1		
Festuca idahoensis	7.6**	20.5	10.1 *	17.4	17.9	17.1
F. scabrella	71.1**	4.3	44.6	35.3	41.7**	4.2
Koeleria cristata		1.8	1.6	2.0	11.8 *	8.3
Poa juncifolia		11.0				
P. pratensis					0.4	1.3
P. sandbergii			0.4	1.2	**	6.6
Stipa occidentalis				0.8		
FORBS						
Achillea millefolium	2.1	4.1	0.7 *	2.8	5.0 *	1.4
Agoseris glauca			2.1	2.1		
Allium cernuum			0.3	0.2	P *	1.0
Anaphalis margaritacea				0.2		
Anemone patens			2.1	3.0		
Antennaria rosea	0.2 +	1.3	P	0.2	2.0	4.5
A. anaphaloides					8.4 *	3.2
Arenaria congesta	0.3 *	1.8	1.6	2.1	1.4	2.3
Arabis hirsuta			0.2	0.5		
Arnica fulgens			2.4**	8.7		
Artemisia ludoviciana	1.0 +	3.1				
Aster spp.	4.8					
A. falcatus	**	2.0				
A. integrifolius	9.0 *	4.2				
A. campestris					2.6	1.8
Campanula rotundifolia			1.4	0.8	1.3	1.8
Cerastium arvense	0.2	0.4	1.6 *	5.4		

Table C3 - (Continued) - Page 2

HABITAT TYPE:	*FESC/FEID*		*FESC/FEID* *GEVI* Phase		*FESC/FEID* *GEVI* Phase	
STAND NO:	198	199	37	38	241	242
GRAZING:	None	Heavy	None	Moderate	None	Heavy
FORBS: (continued)						
Centaurea maculosa					+	5.4
Clematis hirsutissima			3.2	4.4		
Dodecatheon conjugens					0.7 *	0.2
Draba crassifolia					0.5	0.3
Erigeron compositus					P +	0.2
E. speciosus					5.1	5.1
E. subtrinervis			6.8 +	3.8		
Eriogonum umbellatum			6.0	5.8	5.0 +	1.6
Gaillardia aristata			0.4	0.4		
Geum triflorum	P	0.4	*	3.2	5.3**	0.4
Geranium viscosissimum			6.4	7.9	29.2**	10.5
Hieracium albertinum					3.9 *	P
H. cynoglossoides			8.4**	0.4		
Heuchera cylindrica					3.1 *	P
Lomatium triternatum			0.1	0.1		
Lupinus sereceus			13.3	11.5		
Phlox longifolia					3.8 +	1.8
Potentilla arguta					2.0**	
P. glandulosa			0.1	0.1		
P. gracilis			0.2	1.2	13.4**	7.8
P. pensylvanica	0.1 *	1.7				
Solidago missouriensis					1.0 +	0.1
S. occidentalis			2.3	2.4		
Taraxacum officinale			+	0.2	**	2.4
Tragopogon dubius						0.5
Vicia americana					0.1 +	0.9

Table C4.--Differentially-grazed paired stands in the *Festuca idahoensis* SERIES:[1] canopy-cover percent with confidence levels (** = >99%, * = 95-98%, and + = 90-94% probability of means differing statistically).

HABITAT TYPE:	*FEID/AGSM-AGDA*		*FEID/AGSP*		*FEID/AGSP*		*FEID/AGSP STOC* Ph.		*FEID/AGSP STOC* Ph.		*FEID/(AGCA)*	
STAND NO:	163	164	105	106	113	112	200	201	176	177	44	43
GRAZING:	None	Moderate	None	Moderate	None	Moderate	None	Moderate	Slight	Moderate	None	Moderate
COVER CLASS.												
Shrubs	1.6**	5.2	4.2 +	8.6	14.9**	3.6			5.5	4.1		
Graminoids	67.1**	49.4	71.9 *	64.1	85.4**	66.8	78.2**	59.0	75.9**	64.2	76.8	77.9
Forbs	34.9**	8.9	33.1**	13.9	31.0	25.7	62.1	63.4	52.4**	41.1	40.2	49.1
Bryophytes	25.5	28.2	13.4**	5.5	15.9 *	24.3	3.2**	12.7	6.2**	15.7	8.9	5.4
Bare Ground	P **	6.5	0.9**	6.5	0.2**	3.7	0.6**	1.6	0.3 *	1.9	10.6 +	4.2
Litter	75.8**	43.1	22.5	22.8	11.8**	23.6	84.4**	73.5	84.7 *	80.4	29.3	27.9
Rock	P **	5.0	0.7	0.2	0.6 +	2.0	1.9**	10.3	1.1	1.2	0.8	0.4
SHRUBS												
Artemisia cana	0.8	0.4			0.4							
A. dracunculus			P *	1.4								
A. frigida	0.8**	3.8	0.4 *	3.7	0.6 *	2.5			5.5	4.1		
Chrysothamnus nauseosus	P	0.4	0.4	1.8	0.1							
C. viscidiflorus			3.2	2.1	7.7**	1.2						
Tetradymia canescens	P	0.4	P		6.7 *	P						
GRAMINOIDS												
Agropyron caninum							3.2 +	0.5			0.4	0.1
A. dasystachyum								* 1.6				
A. smithii	4.0	3.8										
A. spicatum	P +	0.2	33.9**	11.4	22.1**	0.5	11.2**	3.6	21.6**	8.7		
Carex filifolia							1.6	1.7				
C. obtusata							17.8	15.7	26.1**	16.9		
C. petasata									P	2.1	6.3	5.2
C. stenophylla	**	2.8	1.1 +	2.6	1.1 +	0.1					2.3	2.3
Danthonia intermedia							0.4				29.7**	42.6
Festuca idahoensis	66.4**	8.4	24.3	30.9	76.0**	45.9	56.0**	25.2	39.7	33.6	41.9**	23.6
Helictotrichon hookeri							0.1 *	1.5	0.2 +	0.9		
Koeleria cristata	1.0	1.6	6.0	4.6	1.6	1.5	1.5	1.7	5.7	7.0	4.8 +	2.1
Poa cusickii	0.3**	19.6					2.9	3.8	0.7	0.8		
P. scabrella											0.4	1.4
P. sandbergii	1.2**	15.6	14.5 *	20.4	0.2 *	0.7						
Stipa comata			1.5**	6.6	0.9**	27.0			0.1	0.8		
S. occidentalis							1.6 *	0.2	2.4	3.6	6.0	7.0
FORBS												
Achillea millefolium			1.6 *	0.2	1.2	1.1	3.2	3.6	1.6 *	5.2	2.6	2.1
Agoseris glauca			11.4**	1.7			7.0**	1.5	3.2 *	P	4.7	5.4
Allium cernuum					0.1	0.1	0.9	0.6	P +	1.1		
Antennaria rosea	3.6	1.4	2.7 +	0.9	6.2 *	2.4	0.8	0.4	5.8	2.5	0.6	0.6
Arenaria congesta			0.7 +		2.0 *	0.1	3.2	4.5	1.4	2.6	0.2	0.2
Arnica fulgens	P +	0.9			P	0.1						

[1] See *Festuca idahoensis* SERIES narrative in text for grazing history of these stands.

HABITAT TYPE:	*FEID/AGSM-AGDA*		*FEID/AGSP*		*FEID/AGSP*		*FEID/AGSP STOC* Ph.		*FEID/AGSP STOC* Ph.		*FEID/(AGCA)*	
STAND NO:	163	164	105	106	113	112	200	201	176	177	44	43
GRAZING:	None	Moderate	None	Moderate	None	Moderate	None	Moderate	Slight	Moderate	None	Moderate
FORBS (continued)												
Artemisia ludoviciana	16.1**	1.1	*	3.0					3.9 *			
Aster integrifolius							8.7**	2.6			4.5**	
Astragalus spp.	5.4**	1.1	0.4	P					2.0	1.8		
A. miser					9.4 *	4.6						
A. purshii							0.4	0.1				
Besseya wyomingensis							1.1	0.4	*	0.3		
Bupleurum americanum							0.4	0.4				
Calochortus gunnisoni									0.7 +	P		
Campanula rotundifolia							2.1	1.2	0.4	0.6	0.5	0.2
Cerastium arvense							8.2	8.5	3.8**	0.6		
Chrysopsis villosa			6.4**	1.5								
Cirsium vulgare											0.1**	8.6
Clematis hirsutissima							3.8	1.9	3.5 *	7.4		
Collomia linearis											2.3 *	
Crepis occidentalis					0.4	0.2			0.1			
Erigeron caespitosa	4.1 *	P	4.1	2.6	4.8	6.0	2.4 *	0.4	3.7	2.5		
E. compositus			1.3	0.8		0.1						
E. filifolius							**	1.7	0.3 *			
E. ochroleucus											5.2	4.4
E. speciosus											1.6	0.8
Eriogonum ovalifolium									0.4			
E. umbellatum											2.2	1.0
Frasera speciosa							0.4	0.2				
Gaillardia aristata	1.8	0.8					8.4	10.2	3.8**	1.0		
Galium borealis							2.6	4.4	3.0 +	1.1		
Gaura coccinea					**	0.6			0.9			
Gentiana affinis											0.4	0.8
Geum triflorum									P	0.4	9.0	+15.8
Hymenoxys acaulis		1.5										
Iris missouriensis							0.4					
Linum perenne							0.4	P				
Lithospermum ruderale			1.6	P								
Lomatium cous					*	0.4						
Lupinus argenteus											7.7**	
L. lepidus											0.3 +	1.2
L. sericeus			6.4**	2.6	12.3	15.0	2.1 +	P	6.9	8.3		
L. wyethia	2.8 *	0.1										
Pedicularis contorta							P **	9.5				
Penstemon procerus											1.8	3.4
Phlox hoodii	2.0	1.6	0.8 +	2.9	0.4		5.9**	12.8	10.4	10.6		
P. multiflora											2.7 *	0.4
Polygonum bistortoides							0.2					
P. douglasii											0.9	
Potentilla glandulosa											0.2	0.2
P. gracilis											0.7	0.2
P. pensylvanica			0.2				0.1	0.2	P	0.5		
Sedum lanceolatum							0.1**	0.6	0.2			
Solidago missouriensis							P				**	7.3
Taraxacum officinale	0.4		0.4	P	0.2	0.1	0.2		0.2**	1.2	*	0.3
Tragopogon dubius			0.6	P	4.4**	0.1			1.1 *			
Vicia americana							9.8**	1.4				
Zygadenus spp.					0.5		0.2 +	P	0.1			