AN INFORMATION PROTOCOL FOR THE APPLICATION OF NATURAL AREAS IN ECOSYSTEM MANAGEMENT AND STEWARDSHIP

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Introduction

Federal land management agencies have pursued development of a national network of research natural areas since the 1920s. Since that time, two objectives have been the primary purpose for developing a comprehensive, representative system of natural areas: (1) "to preserve a representative array of all significant natural ecosystems and their inherent processes as baseline areas," and (2) "to obtain through scientific education and research, information about natural system components, inherent processes, and comparisons with representative manipulated systems" (Federal Committee on Ecological Reserves 1977). USDA Forest Service objectives for the establishment of research natural areas are (USDA Forest Service Manual [FSM 4063.02]):

1. to preserve a wide spectrum of pristine areas that represent important forest, shrubland, grassland, alpine, aquatic, geological, and similar natural situations that have special or unique characteristics;
2. to preserve and maintain genetic diversity;
3. to protect against serious environmental disruptions;
4. to serve as reference areas for the study of succession;
5. to provide on-site and extension education activities;
6. to serve as baseline areas for measuring long-term ecological changes;
7. to serve as control areas for comparing results from manipulative research; and
8. to monitor effects of resource management techniques and practices.

The USDA Forest Service played a historic role in the recognition and establishment of research natural areas (Habeck 1979). The basic idea of the FSM policy - the designation of representative pristine sites to serve as reference areas for basic research, education, and to monitor the effects of intensive management activities - however, is historically expressed as well in the literature of professional forest and range management societies. Anderson (1975) (and see Buckman and Quintus 1972; Allen 1986; Wellner 1986) describes the purpose of, and need for, research natural areas:

> 1. Because natural biological and physical processes occur unhindered in natural areas, these areas serve as a baseline or standard against which the effects of man's intervention in the natural environment can be studied and evaluated.
>
> 2. Natural areas are the cornerstone of the sciences of resource management. In respect to range science, they provide the basis for (a) defining range sites; (b) determining range condition; and (c) determining the trend of range conditions under grazing and other uses of the resource, all of which are fundamentally the ecological basis for range management.
>
> 3. Natural areas provide representative plant communities or ecosystems which serve as outdoor laboratories where we can increase our knowledge about ecological dynamics, the specific effects of herbivores on the ecosystem, and the impacts of man's ever-increasing manipulations of the landscape....

The need for research natural areas has a fundamental basis in the National Forest Management Act (NFMA) which states that land and resource management plans will include a plan to monitor and evaluate the effects of implementing the management plan (36 CFR Sec. 219.11(d); Burns 1984; Norse et al. 1986). Natural areas contribute to the land management planning process by providing models of benchmark landscape features and habitat conditions (Ryan et al. 1994; Andrews 1994). At the time NFMA was enacted by Congress (1976) the following statement by the chair, Committee on Natural Areas, Society of American Foresters (Shanklin 1951), had standing (though it was made two and one half decades earlier), as it still does today:

> Natural areas or segments thereof are laboratory examples of the interrelationships of flora, soil, and water, as found within virgin timber types. How may we measure the changes in plant ecology if we do not have a natural measuring device with which to make the essential comparisons? The natural areas or a sample plot within might well be utilized for such purposes.

The role of ecological reference areas is heightened within the ecosystem management paradigm - "management driven by explicit goals...and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function" (Christensen et al. 1996). Implementation of adaptive management strategies is a focal component of ecosystem management. In adaptive management - which involves a repetitive, ordered cycle of planning, implementation, monitoring, and evaluation - the hypothetical, iterative nature of resource management is recognized (Forest Ecosystem Management Assessment Team 1993; Christensen et al. 1996). A principal tenet of ecosystem management is that biological diversity, productivity, and sustainability may be maintained or enhanced by managing lands within the historic range of variability (Swanson et al. 1994). Research natural areas provide the experimental controls against which ecosystem management activities may be assessed, the baseline for understanding the range of natural variability, and help establish a basis for defining desired conditions (Ryan et al. 1994; Andrews 1994; Wellner 1986; Franklin et al. 1972; Moir 1972).

Arguments for the need of research natural areas have been successful. In Idaho alone the number of established NFS RNAs has risen gradually from three in 1960 (Shanklin 1960) to 117 today. This system of natural areas provides representation of 323 plant associations in 1041 occurrences. Selected RNAs have been utilized in basic research (e.g., Moeur 1992) to the extent that, "generations of scientists and land managers now owe their appreciation and understanding of natural ecosystems, their complex interrelationships and their diversity, to the vital education resources represented in natural areas" (Franklin et al. 1972). Implementation of RNA objectives in management activity planning and evaluation, however, has occurred infrequently (with the notable exceptions described by Andrews 1994). The objective of this report is to assist with the use of RNAs and other reference areas in ecosystem management project planning and evaluation by providing a protocol for bringing summarized information on the ecology, conservation, and management of plant associations forward with site specific information on stands of the association that occur within RNAs.

The Information Protocol and Report

The Ecological Society of America was involved early in the history of natural area establishment. In 1917 the Society formed the Committee for the Preservation of Natural Conditions for Ecological Study. After functioning to promote natural areas for scientific purposes for two and one-half decades the Society disbanded the committee. In 1946 a group of interested ecologists formed an independent group called the Ecologists' Union. The group was shortly reorganized and named The Nature Conservancy (McIntosh 1985).

The large success of the Conservancy in the ensuing years has been development of state natural heritage inventory programs. Heritage programs maintain a permanent and dynamic atlas and data bank on the distribution, abundance, and conservation status of all the elements of natural biological and ecological diversity; sites where these elements occur; and sources of additional information and documentation. The natural heritage inventory system includes a computerized database (the Biological and Conservation Data System, BCD), map files, literary reference files, and standardized field methods. While a range of different information storage and retrieval systems pertain to natural areas, the natural heritage inventory system has been particularly successful because (1) it is based on common units of comparison - *elements* of biological diversity (individual plant and animal species and terrestrial and aquatic communities) and *element occurrences* are the focus of inventory and analysis; (2) information is efficiently compartmentalized; and (3) standardization in inventory methods is based on multi-institutional cooperation (The Nature Conservancy 1982; The Nature Conservancy et al. 1996).

To compile information on the ecology of plant associations and occurrences within RNAs, fields were selected from seven database files within the BCD. Information in these files is compiled into a standard report entitled, *Ecology and Stewardship Reference Area Report*. Examples of the report for *Abies grandis/Acer glabrum*, *Alnus incana*/Mesic forb, and *Juniperus osteosperma/Artemisia arbuscula/Agropyron spicatum* appear in Appendices 1 - 3. Following is a brief description of the files contributing information to the *Ecology and Stewardship Reference Area Report* (adopted from The Nature Conservancy et al. 1996). A data model depicting the relations between each file is shown in Appendix 4. Definitions of each field are listed in Appendix 5. The organization of each field within the *Ecology and Stewardship Reference Area Report* is shown in Appendix 6, a summary of the BCD merge form structure.

Community Characterization Abstract (CCA)--The CCA file contains detailed information about the attributes of plant associations found within the state. The file serves as an abstract of field observations and published literature regarding the ecology, distribution, and abundance of plant associations.

Element Global Ranking (EGR)--This file contains information on the plant association's global rank (i.e., its relative rarity or endangerment in the world), the criteria used to determine that rank, and the global research, inventory, protection and stewardship needs for the plant association. The EGR contains detailed specifications defining what qualifies

as an "occurrence" of the association (the EOSPECS), as well as specifications for ranking the occurrences. EGR records (including global ranks) are completed by a designated lead office in the Heritage/CDC network.

For each plant association, the influence of at least seven basic factors are considered when assigning a global rank. These include:

- the estimated distribution and number of occurrences throughout its range;
- the estimated abundance of the association;
- the estimated size of its range;
- the trend in distribution over its range;
- the estimated number of adequately protected occurrences throughout its range;
- the degree to which the association is threatened globally;
- the fragility or susceptibility of the association to perturbation.

EGR-related information is useful for understanding the relative rarity or endangerment of an association from a global perspective. The record also provides essential information for identifying and delineating (1) high quality occurrences in the field, and (2) thresholds for the maintenance of the integrity of vegetation conditions.

Element Occurrence Record (EOR)--The file contains information on the occurrence of plant associations. Each record in the file represents a different plant community element occurrence (EO) defined as a specific example of the community at a specific geographic location. Each known occurrence is coded, ranked, and described. Information on the location, protection, and ownership are given, with references to research and documentation on the occurrence. Plant community element occurrence records are part of the building blocks of biological diversity conservation information. They may be used in environmental review, preserve selection and design, and conservation planning.

Element Stewardship (ES)--This file contains information on the stewardship management of selected plant associations. The ES record summarizes management, monitoring, and research programs and needs.

Element Tracking (ET)--This file contains information that identifies the plant community elements within Idaho and tracks the classification and conservation status of each element at the global, national, and state levels. The concept of an element is fundamental to Natural Heritage Program methods and to the inventory of biological diversity. An element is a unit of natural biological diversity. Fine "filters" of diversity include plant and animal species. Plant communities can be thought of as representing a "coarse filter" for natural diversity. By identifying and preserving the best examples of all terrestrial and aquatic plant associations, a significant portion of the biological diversity of a given area can be preserved. The use of terrestrial, aquatic, and subterranean communities as a "coarse filter" helps ensure that the Heritage/CDC Network is inventorying the complete spectrum of biological diversity, not just those species whose priority conservation status

has been documented. Protecting the best examples of all communities also ensures better conservation of ecological processes and the biotic interactions that are necessary to sustain biological diversity.

Site Basic Record (SBR)--The file contains scientific and ecological information on various sites on the landscape. Each record in the SBR file describes a particular site, its location, size, design considerations, biological significance, protection and stewardship concerns and the element occurrences present. Sites are defined fundamentally as units of the landscape which are of scientific and ecological interest.

The *Ecology and Stewardship Reference Area Report* provides a summary of information on the ecology, classification, conservation, and stewardship of plant associations represented in RNAs and other ecological reference areas. Reference stand conditions are summarized and exemplary reference occurrences are identified and described. The report and associated database files provides a protocol for coupling relevant information on the ecology, conservation, and management of plant associations with site specific information on occurrences within ecological reference areas. Application of this protocol will vary depending on the information available. For example, relatively general information on *Abies grandis/Acer glabrum* is available (Appendix 1) for a high level of stand differentiation at few sites (actually only one site, Dry Buck RNA). By comparison, detailed information on *Juniperus osteosperma/Artemisia arbuscula/Agropyron spicatum* is summarized for stands at a moderate number of sites (Appendix 3).

A number of different databases are currently employed to maintain vegetation stand data. These are primarily used by Federal land management agencies for plot level data. Examples of other vegetation related databases are the Fire Effects Information System (FEIS) and the Long-Term Ecological Research (LTER) Network Information System. FEIS (developed by USDA Forest Service Intermountain Research Station, Fire Sciences Laboratory, Missoula, Montana) provides information regarding the effects of fire on plant species and ecosystems. The ecosystem module of FEIS provides information similar to that reported in the *Ecology and Stewardship Reference Area Report*, but it has not been extensively populated and does not relate information to specific sites.

The LTER Network Information System (maintained by LTER site information managers, with support from the National Science Foundation) provides access to detailed data sets on species populations, plant ecology and physiology, and site physical environmental parameters. While this data network links ecological information to specific research sites, the number of sites is highly restricted and the ecological information is (by design) raw, un-summarized data. The BCD is the only data system in wide use that readily provides a linkage between summarized ecological information and reference area sites. BCD provides unique power - as demonstrated in the *Ecology and Stewardship Reference Area Report* - in resolving the problem of coupling relevant information on the ecology, conservation, and management of plant associations with site specific information on occurrences within ecological reference areas.

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Appendix 1. *Abies grandis/Acer glabrum*.

Ecology and Stewardship
Reference Area Report

ABIES GRANDIS/ACER GLABRUM
MONTANE CONIFEROUS FOREST

ECOLOGY and CLASSIFICATION

Distribution--*Abies grandis/Acer glabrum* (ABGR/ACGL) (with two phases, *Acer glabrum* [ABGR/ACGL, ACGL] and *Physocarpus malvaceus* [ABGR/ACGL, PHAM]) is described by Steele et al. (1981) for the Idaho Batholith and Blue Mountains ecoregional sections. Johnson and Simon (1987) describe similar communities (they identify as *Abies grandis/Acer glabrum* and *Abies grandis/Acer glabrum-Physocarpus malvaceus* [ABGR/ACGL-PHMA]) for the Blue Mountains section. In Idaho, the plant association is known to occur primarily in the West, Cuddy, Seven Devil, and western Salmon River Mountains. The plant association is common (occupying > 1 but < 5 percent of the land mass) in the western and eastern portions, respectively, of the Idaho Batholith and Blue Mountains sections. Most of the ABGR/ACGL stands identified by Johnson and Simon (1987) appear to be similar to the ABGR/ACGL, ACGL described by Steele et al. (1981), and are treated as synonymous in Idaho. The ABGR/ACGL-PHMA identified by Johnson and Simon (1987) is treated as synonymous with ABGR/ACGL, PHMA described by Steele et al. (1981). The stands sampled by Crowe and Clausnitzer (1995) and classified as ABGR/ACGL are also treated as synonymous to ABGR/ACGL, PHMA.

Vegetation--*Abies grandis/Acer glabrum* sites are highly to very highly productive. *Pinus ponderosa* and *Pseudotsuga menziesii* are competitive, long-lived early-seral tree species and may dominate stands for several hundred years. Tall shrubs (*Acer glabrum*, *Amelanchier alnifolia*, *Physocarpus malvaceus*, *Rosa gymnocarpa*, or *Spiraea betulifolia*) are well represented to abundant. Herbaceous cover is usually low; species consistently present include: *Arenaria macrophylla*, *Chimaphila umbellata*, *Osmorhiza chilensis*, *Smilacina racemosa*, and *Thalictrum occidentalis*. *Carex geyeri* and *Calamagrostis rubescens* are usually present in the *Physocarpus malvaceus* phase.

Environment--*Abies grandis/Acer glabrum* occurs at moderate elevation within a region of relatively mild climatic conditions. Moist, mild winter climatic conditions effectively lengthen the growing season on these sites compared to adjacent higher- and lower-elevation sites. The sites are highly productive. The plant association occurs on north- to east-facing slopes in mid- to lower-slope positions at 3800 to 6400 feet elevation. Steele et al. (1981) describe two phases of the plant association: *Physocarpus malvaceus* and *Acer glabrum*. The *Physocarpus malvaceus* phase occurs on relatively warm, dry sites. The *Acer glabrum* phase occurs on more moist sites and is the more productive of the two phases. The plant association typically occurs as large stands, occupying entire slopes. The two phases occur adjacent one another, in response to topographical undulations from north- to south-facing aspects. On adjacent cooler, more moist sites, *Abies grandis/Senecio triangularis*, *Abies grandis/Clintonia uniflora*, or *Abies grandis/Linnaea borealis* may be present. On adjacent warmer, drier sites *Abies grandis*/*Spiraea betulifolia* or *Pseudotsuga menziesii*/*Physocarpus malvaceus* may be present.

Few detailed fire history studies regarding the association have been conducted. Crane and Fischer (1986) hypothesize that open, parklike stands dominated by *Pinus ponderosa* and *Pseudotsuga menziesii* were favored in pre-settlement times under a disturbance regime of relatively frequent, low-intensity fire. These conditions likely mostly occurred in the *Physocarpus malvaceus* phase of the association. Individual large- and very large-sized *Pinus ponderosa*, in stands located in the N. Fork Payette and Little Salmon river drainages, often show evidence of 3 - 5 historic fire events; suggesting a fire return interval of less than 50 - 60 years. With longer fire return intervals (perhaps due to stochastic factors effecting fire ignition and spread) these sites will support high intensity fire as ground and ladder fuels accumulate rapidly on these relatively productive sites.

Information Needs--The natural fire disturbance regime needs to be formally investigated.

REFERENCE STAND CONDITIONS

Occurrence specifications--The primary factors considered in evaluating the representative quality and viability of *Abies grandis/Acer glabrum* occurrences are: the size, landscape context , and condition (seral status, structural condition, and species composition). The size of occurrences of the plant association is a basic factor (in relation to slope position and configuration) determining the proportion of the stand that provides edge versus interior habitat conditions. Mid- to late-seral stands that are 40 acres and less provide only edge environmental conditions. Stands of the association typically occupy entire slopes of first to second order drainage basins. The landscape context of the association occurs on the scale of assemblages of several first order drainage basins or entire second order basins. The seral status and structural condition of stands is influenced primarily by natural fire disturbance. Element occurrences may be early- to late-seral. Structural conditions range from herb-shrub dominated to giant tree dominated (see Rust [1997] for descriptions of the seral and structural class conventions). Late-seral, medium tree (and smaller) dominated stands typically result from management and are not considered representative of (or are very rare under) natural conditions. Mapping conventions: Stands are delineated at the phase level on the basis of seral status and structural condition. Stands occurring within one contiguous standard site are considered a single occurrence. Occurrence ranking convention: Ranks are calculated as the average of the indecently determined size, landscape, and condition ranks.

'A' Rank Descriptions--Size: stands encompass entire slopes of first to second order drainage basins (300 - 700 acres [summing the area of occurrence types and phases]). Landscape context: Intact. Natural (unaltered by the effects of timber harvesting or road construction) forest vegetation is predominant in the adjacent first or second order drainage basin. Natural or fully recovered (the effects of timber harvesting or road construction are only distinguishable on the ground; roads, if present, are fully stabilized and vegetated) forest vegetation dominates the associated second or third order drainage basin. Condition: Large coarse woody debris is common (the sum of snags and logs > 20 inches in diameter is > 4 per acre). Tall shrubs are well represented to abundant. Herbs and graminoids are present to common. Bare mineral soil is rarely present (except on game trails). Exotic species are absent.

'B' Rank Descriptions--Size: stands encompass small-sized slopes of first to second order drainage basins (160 - 300 acres [summing the area of occurrence types and phases]). Landscape context: Managed. Natural or fully recovered (the effects of timber harvesting or road construction are only distinguishable on the ground; roads, if present, are fully stabilized and vegetated) forest vegetation is dominant in adjacent first or second order drainage basins. The effects of intensive resource management activities are subordinate in the associated second or third order drainage basin. Condition: Large coarse woody debris is present (the sum of snags and logs > 20 inches in diameter is > 1 per acre). Tall shrubs are well represented to abundant. Herbs and graminoids are usually present to common, but may be well represented in patches. Bare mineral soil is rarely present. Exotic species may be present but are not common. The effects of past timber harvest are minimal (< 1 stump per acre is present in decay class 4 or 5).

'C' Rank Descriptions--Size: stands encompass partial slopes of first to second order drainage basins (40 - 160 acres [summing the area of occurrence types and phases]). Landscape context: Fragmented. The effects of intensive resource management are subordinate in the adjacent first or second order drainage basin. The effects of intensive resource management dominate (numerous patches of early- to mid-seral stands created through management activities provide the matrix for few mid- to late-seral stands) the associated second or third order drainage basin. The landscape is predominantly dedicated to sustained resource management and conservation. Condition: Tall shrubs are common to well represented with patchy cover. Herbs and graminoids are usually present to common, but may be well represented in numerous large patches. Bare mineral soil is present to common. Exotic species are common to abundant in patches. The effects of past timber harvest are usually obvious (numerous medium- to very large-sized stumps are present, usually in decay class 3 or less).

'D' Rank Descriptions--Size: Stands encompass partial slopes of first to second order drainage basins (10 - 40 acres [summing the area of occurrence types and phases]). Landscape context: Developed. Natural vegetation within the associated second to third order drainage basins is highly fragmented and subordinate to vegetation converted to agricultural or residential uses. The landscape is predominantly dedicated to agricultural, residential, or industrial/commercial landuses. Condition: Tall shrubs are common with patchy cover. Herbs and graminoids are usually well represented to abundant in large continuous patches. Bare mineral soil is common. Exotic species constitute

a major component of the flora.

Exemplary reference occurrences:

DRY BUCK RNA - *Acer glabrum* phase
Occurrence type: early-seral, pole tree
Occurrence size (acres): 5.83
Description: One early-seral, pole dominated stand occurs on the southern boundary of the site. The stand was apparently initiated by fire in 1931. The stand is identified on the basis of aerial photography.
Occurrence rank and justification: 'A'. Stands of early-seral, pole dominated *Acer glabrum* phase are small, but associated with large stands of other occurrence types and phases of the association. Adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.
Observation information: 1985: C. Wellner and R. Moseley reported the association as occurring within the site in a range of seral and structural conditions. 1995: One stand was mapped and qualitatively described by S. Rust. The stand identification (and size) is 14 (5.8).

DRY BUCK RNA - *Acer glabrum* phase
Occurrence type: early-seral, shrub-herb
Occurrence size (acres): 79.54
Description: Two stands of early-seral, shrub-dominated ABGR/ACGL, ACGL are located in the southern first order drainage of the site. *Acer glabrum* and *Physocarpus malvaceus* are abundant with patchy *Pinus ponderosa* and *Pseudotsuga menziesii* regeneration. Dispersed remnant large diameter *Pinus ponderosa* are present. Individual live *Pinus ponderosa* and *Abies grandis* show 5 and 4 fire events, respectively.
Occurrence rank and justification: 'A'. Stands of early-seral, shrub dominated *Acer glabrum* phase are large and associated with large stands of other occurrence types and phases of the association. Adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.
Observation information: C. Wellner and R. Moseley (9/15/85) and C. Wellner and J. Clayton (9/13/88) reported the association as occurring within the site in a range of seral and structural conditions. S. Rust (11/2/95) delineated and qualitatively described two stands of early-seral, shrub dominated ABGR/ACGL, ACGL. The stands (and sizes) are 11 (29.2) and 15 (50.4).

DRY BUCK RNA - *Acer glabrum* phase
Occurrence type: late-seral, large tree
Occurrence size (acres): 180.29
Description: Late-seral stands of ABGR/ACGL, ACGL are structurally dominated by large-sized *Abies grandis*. Few large-sized *Pinus ponderosa* are also present. Many of the large overstory trees have broken tops. Large-sized logs are common. Stem density is low. Only *Abies grandis* regeneration is present. The understory is open with low herb and shrub cover.
Occurrence rank and justification: 'A'. Stands of early-seral, shrub dominated *Acer glabrum* phase are large and associated with large stands of other occurrence types and phases of the association. Adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.
Observation information: C. Wellner (5/2/87) and C. Wellner and J. Clayton (9/13/88) reported old growth stands of the association as occurring within the site. S. Rust (11/2/95) delineated and qualitatively described one late-seral, large tree dominated ABGR/ACGL, ACGL stand. The stand (and size) is 7-21 (180.3).

DRY BUCK RNA - *Acer glabrum* phase
Occurrence type: mid-seral, medium tree
Occurrence size (acres): 165.44
Description: Mid-seral, medium tree dominated stands of ABGR/ACGL, ACGL occur in the southern drainage of the site. These stands encompass a mosaic of patches dominated by shrubs, poles, and large trees. The overstory canopy is generally open; the density of medium-sized and larger trees is low. *Pinus ponderosa* and *Pseudotsuga menziesii* are dominant in the overstory. *Pseudotsuga menziesii* and *Abies grandis* regeneration is present within a dense understory

shrub canopy. Mortality is common in medium-sized *Abies grandis*.

Occurrence rank and justification: 'A'. Stands of mid-seral, medium-sized tree dominated ABGR/ACGL, ACGL are large and associated with large stands of other occurrence types and phases of the association. Adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner and R. Moseley (9/15/85) reported the association as occurring within the site in a range of seral and structural conditions. S. Rust (11/2/95) delineated three stands of mid-seral, medium tree dominated ABGR/ACGL, ACGL. The stands (and sizes) are: 13 (100.8), 18 (62.0), and 22 (2.6).

DRY BUCK RNA - *Physocarpus malvaceus* phase

Occurrence type: early-seral, pole tree

Occurrence size (acres): 33.94

Description: These stands are located on southwestern facing slopes, in lower slope positions within the central portion of the site. The stands were initiated in the 1930's, re-establishment has been relatively rapid. These sites are typically in the stem exclusion phase. Dead and down pole-sized *Pseudotsuga menziesii* are abundant. *Pseudotsuga menziesii* and *Pinus ponderosa* poles dominate the stands. *Abies grandis* regeneration is present in the understory, though the few individuals in the overstory are senescent. Understory vegetation is depauperate. Remnant large *Pseudotsuga menziesii* and *Pinus ponderosa* are dispersed to clustered. Dense patches of *Salix scouleriana* are common. One large *Pinus ponderosa* shows sign of five fire events, the last event was particularly intense.

Occurrence rank and justification: 'A'. Stands of early-seral, pole dominated ABGR/ACGL, PHMA are moderately-sized, but associated with large stands of other occurrence types and phases of the association. The stands appear viable as adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner and R. Moseley (9/15/85) and C. Wellner and J. Clayton (9/13/88) reported the association as occurring within the site in a range of seral and structural conditions. S. Rust (11/2/95) delineated and qualitatively described three stands of early-seral, pole dominated ABGR/ACGL, PHMA. The stands (and sizes) are: 3 (7.4), 4 (21.2), and 16 (5.3).

DRY BUCK RNA - *Physocarpus malvaceus* phase

Occurrence type: early-seral, shrub-herb

Occurrence size (acres): 18.56

Description: This stand is located in the southern drainage of the site, on a southwestern-facing slope, in a mid-slope position. The stand burned severely in the 1930's. Tree establishment has been relatively slow. *Pinus ponderosa* and *Pseudotsuga menziesii* are just emerging from the dense tall shrub canopy of *Acer glabrum*, *Amelanchier alnifolia*, and *Salix scouleriana*. *Pinus ponderosa* regeneration is most abundant. Large seedling-sized *Abies grandis* are present in the understory. *Calamagrostis rubescens* and *Pteridium aqualinum* are locally well represented.

Occurrence rank and justification: 'A'. The stand is small, but it is associated with large stands of other occurrence types and phases of the association. The stand appears viable as adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner and J. Clayton (9/13/88) reported the association as occurring within the site in the shrub dominated seral status. S. Rust (11/2/95) delineated the stand (identified as '12' on the aerial photograph overlay).

DRY BUCK RNA - *Physocarpus malvaceus* phase

Occurrence type: late-seral, large tree

Occurrence size (acres): 18.03

Description: This stand is located on the ridge between the Williams Creek and southern drainages within the site, in a mid-slope position. The stand has an open-parklike structure. Large-sized *Pseudotsuga menziesii* and *Abies grandis* are dominant in the overstory. Numerous well decayed logs are present (including recent large dead and down *Abies grandis*). Large diameter *Pseudotsuga menziesii*, *Pinus ponderosa*, and *Abies grandis* snags are present. *Amelanchier alnifolia* occurs with an arbescent growth form. Herbaceous vegetation is more abundant than shrub. Shrubs, where

present, are heavily browsed by elk. The stand is used by elk as winter range thermal cover.

Occurrence rank and justification: 'A'. The stand is small, but it is associated with large stands of other occurrence types and phases of the association. The stand appears viable as adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner J. Clayton (9/13/88) reported the association as occurring within the site. S. Rust (11/2/95) delineated and qualitatively described the stand (identified as '17' on the aerial photograph overlay).

DRY BUCK RNA - *Physocarpus malvaceus* phase

Occurrence type: mid-seral, medium tree

Occurrence size (acres): 34.47

Description: These stands are located on southeastern facing slopes, in lower-slope positions. *Pinus ponderosa* and *Pseudotsuga menziesii* are dominant in the overstory.

Occurrence rank and justification: 'A'. The stands are small, but associated with large stands of other occurrence types and phases of the association. The stand appears viable as adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner (5/2/87) reported the association as occurring within the site. S. Rust (11/2/95) delineated and qualitatively described the stands. They are identified as: 1 (24.9 a.) and 8 (9.5 a.).

DRY BUCK RNA - *Physocarpus malvaceus* phase

Occurrence type: mid-seral, large tree

Occurrence size (acres): 163.32

Description: These stands are located in the (south fork) Williams Creek drainage on east- and southeastern-facing slopes. Large diameter *Pinus ponderosa* and *Pseudotsuga menziesii* dominate these sites. Few medium-sized *Abies grandis* are present with dispersed to locally abundant *Abies grandis* and *Pseudotsuga menziesii* understory regeneration. *Physocarpus malvaceus* is well represented to abundant with dispersed, small patches of *Acer glabrum*. Open patches of *Carex geyeri* and *Calamagrostis rubescens* are common. ABGR/ACGL, ACGL occurs as microsite inclusions with increased northeastern aspect.

Occurrence rank and justification: 'A'. Large stands are associated with large stands of other occurrence types and phases of the association. The stand appears viable as adjacent second order drainage basins are intact and in a predominantly natural condition. The occurrence is of high, pristine representative quality.

Observation information: C. Wellner (5/2/87) and C. Wellner and J. Clayton (9/13/88) reported the association as occurring within the site. S. Rust (11/2/95) delineated and qualitatively described three stands of mid-seral oldgrowth ABGR/ACGL, PHMA. They are identified as (acres): 2 (14.3), 9-19 (89.9), and 10-20 (58.8).

CONSERVATION STATUS

Threats and trends in viability--The association is resilient to natural disturbances. The effects of perturbation of the natural disturbance regime or successional pathways are profound. High quality, representative conditions of the association are threatened by continued movement toward increased susceptibility to intensive fire disturbance and the disproportional representation of late-seral stands. The condition of stands is declining rapidly due to past overstory removal by partial-cut harvest practices and fire suppression. Partial cut harvest practices have resulted in a mosaic of dispersed (low to moderate density) remnant large- and very large-sized *Pseudotsuga menziesii* and *Pinus ponderosa* and moderate to high density medium-sized *Abies grandis*, *Pseudotsuga menziesii*, and (to less of an extent) *Pinus ponderosa*. As fire return intervals are lengthened (due to management and stochastic factors effecting fire ignition and spread) these sites become more susceptible to high intensity fire. Ground and ladder fuels accumulate rapidly on these relatively productive sites.

Knowledge of occurrences--The number of element occurrences of the association is not known. Steele et al. (1981) describe the association from 49 plots. Five occurrences are located within the following conservations sites: Cuddy Mountain RNA, Dry Buck RNA, Little Granite Creek RNA, Ponderosa Peninsula NA, and Pony Creek RNA. Inventory work is needed to determine more precisely the distribution and current condition of stands. An additional research

natural area should be identified within the Idaho Batholith ecoregional section to provide representation of the plant association. Only one occurrence is protected within the section at this time.

Summary: Global Rank: G2. The association has a limited distribution in the Idaho Batholith and Blue Mountains ecoregional sections. Though the plant association is considered relatively common within its range, many (if not most) stands are degraded by past high-grade harvest activities or the alteration of the natural fire regime.

STEWARDSHIP and MANAGEMENT

Natural areas selection and design--Sites should contain stands of both the *Acer glabrum* and *Physocarpus malvaceus* phases. A range of seral stages and structural conditions will likely be present. The site boundary should incorporate natural fire breaks and encompass entire slope faces. The sites will necessarily encompass entire several first order, or an entire second order, drainage basin.

Research and monitoring--No research programs related to the plant association are known. Little monitoring is occurring in protected occurrences. Stands on matrix lands are probably not being monitored. The fire history of extant old growth stands should be determined. Methods for restoration of natural stand conditions should be identified and tested. Stand structure and species composition should be monitored using standard ecology methods.

Management and restoration--High quality, representative stands are located within research natural areas on NFS lands. No programs have been identified within these natural areas to maintain natural disturbance regimes. The existence of management programs to maintain natural stand conditions on matrix lands is not known. Most occurrences of *Abies grandis/Acer glabrum, Physocarpus malvaceus* have lapsed 2 - 3 fire intervals. Prescribed fire is needed to maintain disturbance related ecosystem processes. Restoration of mid-seral *Pinus ponderosa*-dominated old growth will likely require manipulation of fast growing, competitive *Abies grandis* sapling-, pole-, and medium-sized trees. The capability to accomplish this with fire or by mechanical means has not been proven.

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Appendix 2. *Alnus incana*/Mesic forb.

Ecology and Stewardship
Reference Area Report

ALNUS INCANA/MESIC FORB
ALLUVIAL RIPARIAN SHRUBLAND

ECOLOGY and CLASSIFICATION

Distribution--The *Alnus incana*/Mesic forb association occurs with relatively low abundance in eastern Washington, Montana, Idaho, Nevada, Utah, Wyoming, and Colorado. Classification of the association is based on 50, 15, 10, and 12 stands, respectively, in Colorado, Utah, Nevada, and Washington. Stands of the association were not differentiated in Montana. The Kovalchik et al. (1993) stands from Washington have shrub and tree composition similar to the Idaho, Utah, and Nevada stands. The understory is somewhat distinct with *Cinna latifolia*, *Streptopus amplexifolius*, and *Athyrium* spp. having high constancy. Their stands may also include some stands treated by Youngblood et al. (1989) as *Alnus incana*/*Cornus stolonifera*. Nevada stands are similar to Utah and southeastern Idaho stands (Manning and Padgett 1992). The seral status of the association is not clear, though many stands are apparently late seral. Hansen et al. (1995) did not differentiate associations, rather all *Alnus incana*-dominated stands are treated as a dominance type. Crowe and Clausnitzer (1997) describe a similar community (*Alnus incana-Cornus stolonifera*/Mesic forb) in which *Cornus stolonifera* is consistently abundant.

Vegetation--The *Alnus incana*/Mesic forb association is characterized by a dense overstory of *Alnus incana*. Forbs are dominant in the understory. Low- to medium-height shrubs (*Cornus stolonifera*, *Ribes lacustra*, and *Rubus parviflorus*) are dispersed throughout the stands. Common forbs are *Galium triflorum*, *Heracleum lanatum*, *Streptopus amplexifolius*, *Tiarella trifoliate*, *Equisetum arvense*, *Equisetum hymale*, and *Gymnocarpium dryopteris*. *Cinna latifolia* is the only grass that is farely consistently present.

Environment--The *Alnus incana*/Mesic forb association occurs on terraces and flood plains adjacent to streams with bed loads of boulders, cobble, and gravel (Kovalchik 1993). Soils are generally shallow; surface textures range from sand to loamy sand. Mottling is typically present within 25 cm of the surface, indicating a seasonally high water table, and most sites remain somewhat moist and well-aerated through summer (Padgett et al. 1989, Kovalchik 1993). Adjacent riparian communities may include the *Populus angustifolia/Rosa woodsii* or *Salix* dominated communities. Adjacent forested communities include those dominated by *Picea engelmannii* and *Pseudotsuga menziesii* (Padgett et al. 1989, Hansen et al. 1995, Manning et al. 1992, Kovalchik 1993).

Alnus incana/Mesic forb stands occur as stable seres. Similar vegetation, however, is seral to various tree- and shrub-dominated plant associations. Padgett et al. (1989) suggests a trend towards *Abies lasiocarpa* and *Picea engelmannii* associations, or as sites become more xeric, *Acer negundo* communities. In Montana, *Alnus incana* communities are reported to have become established after severe stream disturbance resulting from placer mining, annual ice jams, or historic tie drives. Hansen et al. (1995) note that *Alnus incana* dominated seral communities persist for several decades before finally being replaced by the *Salix geyeriana*, *Salix lutea*, or *Pseudotsuga menziesii* associations, depending upon elevation. Grazing may result in conversion of the association to *Alnus incana*/Mesic graminoid (Padgett et al. 1989).

Information Needs--Research needs have not been identified.

REFERENCE STAND CONDITIONS

Occurrence specifications--*Alnus incana* clearly dominates the tall shrub overstory with over 40% cover. Conifers, including *Abies lasiocarpa*, *Picea engelmannii* and *Pinus contorta*, are sometimes present. The undergrowth is characterized by mixed forb cover of *Heracleum lanatum*, *Geranium richardsonii*, *Equisetum arvense*, *Mertensia* spp.,

Aconitum columbianum, *Galium triflorum*, and *Smilacina stellata* with over 100% cover in combination. A somewhat sparse low shrub layer is often present and may include *Lonicera involucrata*, *Ribes* spp., and *Rosa* spp. The following grass species: *Glyceria elata*, *Agrostis stolonifera*, *Elymus glaucus* and *Poa pratensis*, may contribute a combined cover of up to 50%.

'A' Rank Descriptions--SIZE CLASS: Moderate, 325 to 500 feet of stream length (0.4 - 2 acres). QUALITY: Dense, un-fragmented continuous cover of the diagnostic shrub and associated forbs in large patches which may alternate from stream side to stream side. CONDITION: Alien and increaser species absent or present in only trace amounts. Human impacts such as grazing, trails, roads, and stream structures not impacting wetland processes. Upstream dams and diversions absent, hydrologic regime intact. VIABILITY: Edge effects minimized by large size and/or intact wetlands or uplands surrounding occurrence. Reproduction and early seral patches of community present. DEFENSIBILITY: Connected to other relatively natural portions of the landscape in native cover. Surrounding land use compatible with the continued existence of the community.

'B' Rank Descriptions--An occurrence where the viability is questionable due to small size, presence of invasive exotics or increasers, human activity, or surrounding land use. Occurrence will recover with minimal management such as fencing or education.

'C' Rank Descriptions--An occurrence which is small or where vegetation composition and structure is significantly altered due to human impacts such as grazing, water development, recreational activities or agriculture. Invasive exotics or increasers such as *Poa pratensis* contribute significantly to understory (75%). Occurrence can be rehabilitated with active management such as fencing and restoration of natural processes.

'D' Rank Descriptions--Shift in species composition, encroachment of upland species due to dewatering, or extremely small size due to fragmentation. Partial restoration of type is possible with active management such as fencing, shrub replanting, and restoration of natural processes.

Exemplary reference occurrences:

UPPER PRIEST RIVER pRNA

Occurrence size (acres): 2

Description: *Alnus incana*/Mesic forb occurs within oxbows and on the highly sinuous lower reaches of Priest River, above Priest Lake. Associated species include *Heracleum lanatum*, *Senecio triangularis*, *Rhamnus alnifolia*, and *Athyrium filix-femina*.

Occurrence rank and justification: 'A'. The large-sized occurrence is within a large area of pristine, native vegetation. The hydrological regime is intact, exotic plant species are absent, and adjacent trails (or other human activities) are not impacting wetland processes.

Observation information: 1996: Observed by M. Jankovsky-Jones and R. Moseley, Idaho CDC.

STAPP-SOLDIER CREEK PRESERVE

Occurrence size (acres): 5

Description: Type forms a mosaic along stream banks with *Populus trichocarpa* and *Carex* dominated community types. *Alnus incana* is reproducing and becoming established on channel bars. *Populus tremuloides* and *P. trichocarpa* saplings have been affected by a blight or disease; it is unknown if this affects *Alnus incana*.

Occurrence rank and justification: 'B'. High quality, but small and patchy occurrence within a protected reach. Exotics are sparse; no evidence of recent livestock use.

Observation information: 1996: Observation and plot 96MJ007 by M. Jankovsky-Jones, Idaho CDC. Plot data is on file.

IRON BOG RNA

Occurrence size (acres): 0.5

Description: Riparian strip with one main channel and a few small side channels along a high gradient stretch.

Alnus incana dominates the canopy with a rich herbaceous understory, especially along segments prone to less scouring. Adjacent uplands support *Artemisia tridentata vaseyana* communities, while *Pinus contorta* patches and *Betula glandulosa/Carex* species characterize the adjacent toeslope bog area.

Occurrence rank and justification: 'A'. *Alnus incana* represents the major riparian community at Iron Bog. Exotics are sparse and the community is well protected within an established RNA.

Observation information: 1997: Observation and plot 97MJ017 (plot data on file) by M. Jankovsky-Jones, Idaho CDC.

CONSERVATION STATUS

Threats and trends in viability--Padgett et al. (1989) note that because of the typically open undergrowth, this plant association is more likely to be impacted by livestock grazing. Forage value for livestock is rated as low to moderate. Livestock grazing should be minimized to maintain these communities (Manning et al. 1992). The association is sensitive to hydrologic alterations and season-long grazing. The distribution of the association is declining due to hydrologic alteration, development, grazing, and introduction of exotic species.

Knowledge of occurrences--Approximately 50 occurrences are located in Colorado. The number of occurrences located in Washington, Montana, Idaho, Nevada, and Utah is not known. Stands of the association occur at Stapp-Soldier Creek Preserve, Iron Bog RNA, and Upper Priest River pRNA. The association is expected to be widespread in much of the Northern Rocky Mountains. The subregional distribution and abundance and condition of stands within its range is largely unknown. High quality, representative stands of the association should be located within the Northwest Basin and Range, Overthrust Mountains, and Blue Mountains ecoregional sections and evaluated for inclusion in a research natural area.

Summary: Global Rank:G3G4Q. The association is widespread throughout its range. However, most occurrences have been degraded by hydrologic alteration and livestock use.

STEWARDSHIP and MANAGEMENT

Natural areas selection and design--Conservation sites selected for the representation of *Alnus incana*/Mesic forb should encompass an entire first or second order drainage basin. Stands of the association and adjacent upland vegetation must be protected from factors that alter the hydrological regime of the site. Adjacent upland vegetation should be in good, functional condition. The presence of natural fire breaks may be desirable. Livestock grazing must be removed from the site to provide high quality reference conditions.

Research and monitoring--The primary management research programs concerning the association are related to description of distribution, composition, and environmental relations. Little monitoring is occurring in protected occurrences. No management research needs have been identified. The association is susceptible to livestock grazing. Heavy grazing will reduce the diversity and cover of understory forbs and mosses and will compact the soil. This may be detrimental to stream side amphibian, small mammal, or insect habitats (Crowe and Clausnitzer 1997). The dense *Alnus incana* overstory provides stream shading. To assess the condition of stands overstory and understory canopy cover and species composition should be monitored.

Management and restoration--No management program specifically addressing the association is known, though it is probably effected by many. Protection from livestock grazing is required to maintain high quality stands. Cool fire will initiate young growth in *Alnus incana* without resulting in mortality. With rest from livestock grazing initial restoration of severely degraded stands may occur in 2 - 5 years. After this time period, the stream channel will stabilize. Stream banks and channel shelves will stay moist season long and begin to support riparian vegetation. Once established, an additional 5 years is required for *Alnus incana* to attain stem diameters and heights sufficient to resist livestock grazing (Kovalchik 1987).

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Appendix 3. *Juniperus osteosperma/Artemisia arbuscula/Agropyron spicatum.*

Ecology and Stewardship
Reference Area Report

JUNIPERUS OSTEOSPERMA/ARTEMISIA ARBUSCULA/AGROPYRON SPICATUM
ROUNDED-CROWNED TEMPERATE OR SUBPOLAR NEEDLE-LEAVED EVERGREEN WOODLAND

ECOLOGY and CLASSIFICATION

Distribution--*Juniperus osteosperma*/*Artemisia arbuscula*/*Agropyron spicatum* (JUOS/ARAR/AGSP) is known from sites in the South Hills, Jim Sage Mountains, Cotterel Mountains, and Bannock Range. The association may also occur in the Sublett Range and Deep Creek Mountains. The abundance of the association is not precisely known. The association is probably at least common (occupying 1 % of the land area) within the Overthrust Mountains and Northwest Basin and Range ecoregional sections. This association incorporates stands identified by Grossman et al. (1994) as *Juniperus osteosperma*/*Purshia tridentata-Symphoricarpos oreophilus*/*Agropyron spicatum*.

Vegetation--Very large-, large-, and medium-sized tree density is low (9 trees per acre) relative to other Utah juniper associations. Understory regeneration is moderately high, with an average of 7 trees per acre pole-, sapling-, and seedling-sized *Juniperus osteosperma*. The understory is occupied by abundant low shrubs, herbs, and grasses. *Artemisia arbuscula* is consistently well represented to abundant. *Symphoricarpos oreophilus* is usually present but not well represented. *Balsamorhiza sagittata* is consistently present and usually well represented. *Opuntia polyacantha* is also an important *herb*. *Agropyron spicatum* and *Poa secunda* are both consistently present; the former being most abundant and well represented to abundant.

Environment--The association is observed on felsic pyroclastic, mixed carbonate, and (primarily) sandstone substrates. Sites are located on mesa tops and upper ridge spurs of moderately high mountainous terrain, most frequently in upper-slope micro-topographical positions. Dry, southeast-, south-, and southwest-facing slopes are horizontally convex, vertically straight, and moderately gentle. JUOS/ARAR/AGSP often occurs in association with fragmented bedrock. Large rock fragments (boulders, cobbles, and stones) occupy between 15 and 45 percent cover.

Information Needs--Information on historic relationships between stand structure and disturbance regimes is needed to effectively maintain high quality occurrences and restore degraded stands.

REFERENCE STAND CONDITIONS

Occurrence specifications--The primary factors considered in evaluating the representative quality and viability of *Juniperus osteosperma*/*Artemisia arbuscula*/*Agropyron spicatum* occurrences are the size, landscape context, and condition. Size: stands occur in mid- to upper-slope positions on ridge spur complexes. As the landscape is highly dissected, these features tend to be relatively small (10 - 30 acres). One occurrence may encompass numerous ridge spurs. Landscape context: the viability of occurrences is affected largely by the landuse practices which dominate the surrounding landscape. Of particular concern is the abundance of exotic plant species, the density of roads and other developments, and the characteristics (size and placement) of fuels in the surrounding landscape. Condition: the principal indicator of the condition of occurrences is the abundance of native bunch grass species (*Agropyron spicatum* and *Poa secunda*) in *Juniperus osteosperma* interspaces. The cover of native bunch grass species appears correlated with the establishment and growth of *Juniperus osteosperma* regeneration. The abundance of native bunch grass species may also influence JUOS/ARAR/AGSP stand structure as a factor determining the size and placement of fuels available to carry relatively low intensity fire through the understory. Other factors that should be considered are (1) the abundance of exotic (particularly annual) grass species, (2) bare ground cover, and (3) the abundance of soil surface mosses and lichens. Mapping conventions: Stands occurring within one contiguous standard site are considered a single occurrence. Conventions for differentiating seral status and structural condition have not been developed. Occurrence ranking conventions: Ranks are determined as the mean of the independently assessed ranks for size, landscape context,

and condition.

'A' Rank Descriptions--Size: the occurrence encompasses several stands (of 5 to 10 a. each) located within a complex of ridge spurs associated with several first order drainage basins. The sum of stand acreage is > 40 a. Landscape context: Intact stands of predominantly native shrub, woodland, and forest vegetation dominate the landscape on adjacent mountain slopes and valley floor (or within the second to third order drainage basin). Condition: Bunch grass species are abundant (> 25 % cover) in *Juniperus osteosperma* interspaces (if the combined cover of bedrock, boulders, stones, and cobbles is high [usually > 20 %] or if *Juniperus osteosperma* assumes a prostrate, wind-trained growth form, the cover of native bunch grass species may be lower, usually > 15 %). Exotic annual grass species may be present but are not common (cover < 1 %).

'B' Rank Descriptions--Size: the occurrence encompasses several stands (of 5 to 10 a. each) located within a complex of ridge spurs associated with several first order drainage basins. The sum of stand acreage is > 20 a. but < 40 a. Landscape context: Managed. Stands of predominantly native shrub, woodland, and forest vegetation dominate adjacent first order drainage basins. The effects of intensive resource management are subordinate in associated second and third order drainage basins. Condition: Bunch grass species are well represented (> 5 % cover) in *Juniperus osteosperma* interspaces. Exotic annual grass species are only common (cover </= 1 %).

'C' Rank Descriptions--Size: the occurrence encompasses several stands (of 5 to 10 a. each) located within a complex of ridge spurs associated with several first order drainage basins. The sum of stand acreage is > 10, but < 20 a. Landscape context: Fragmented. The effects of intensive resource management are subordinate in adjacent first order drainage basins. The associated second or third order drainage basin is predominantly converted to non-native vegetation. Condition: Bunch grass species are usually well represented (> 5 % cover) in *Juniperus osteosperma* interspaces but may be only common. Exotic annual grass species are common to well represented (cover > 1, < 5 %).

'D' Rank Descriptions--Size: the occurrence encompasses few stands (of 5 to 10 a. each) located on a single ridge spur usually associated with only one first order drainage basin. The sum of stand acreage is < 10 a. Landscape context: Developed. Natural vegetation within the associated second to third order drainage basins is highly fragmented and subordinate to vegetation converted to agricultural or residential uses. The landscape is predominantly dedicated to agricultural, residential, or industrial/commercial landuses. Condition: Bunch grass species are only common to present (< 5 % cover). Exotic annual grass species are well represented (cover >/= 5 %).

Exemplary reference occurrences:

GIBSON JACK CREEK RNA

Occurrence size (acres): 83.6

Description: JUOS/ARAR/AGSP occurs on southwest- to west-facing slopes in mid- to upper-slope positions on the ridge spurs of Wild Mtn. Stands vary in seral status and structural condition. Mid-seral stands are present where fuels are continuous. Late-seral stands are present where fuels are interrupted by talus or rock outcropping. The structure of late-seral, mid-slope stands is savanna-like. Ridge crest stands are dominated by low growing wind trained, krumholz *Juniperus osteosperma*. The soil is loess over talus of boulders and stones; well stabilized with a notable lichen/moss mat.

Occurrence rank and justification: 'AB'. The occurrence is large (> 40 a.). The associated second order subdrainage is predominantly intact native vegetation. The condition is assessed as 'AB Rank' as portions of the stands within the occurrence are 'B Rank' (though they have not been delineated). Exotic species are common and common to well represented in 25 and 12 percent, respectively, of plots sampled within the occurrence. Native bunch grass cover was lower than expected on 12 percent of the plots sampled within the occurrence. The overall rank for the occurrence is assessed as 'AB' though it is close to an 'A' rank occurrence.

Observation information: Chuck Wellner identified the stands as occurring within the site on July 14, 1976. Steve Rust collected ecological and environmental data on 16 plots within or adjacent the site on August 28 - 30, 1996. Following is a list of plot id's: 96137, 96138, 96139, 96141, 96142, 96143, 96145, 96146, 96147, 96148, 96150, 96153, 96154, 96155, 96156, and 96160. The average cover of vegetative components is: trees, 24; shrubs, 22; herbs,

20; grass, 24; moss and lichen, 6; and substrate components: rock, 21; gravel and soil, 9 percent cover. Stem densities for large-sized trees and greater was 20 tpa (all old); medium trees and poles, 67 (medium trees are old, poles are mixed old and mature); and saplings and seedlings, 13 (mixed old, mature, and young).

JIM SAGE CANYON RNA

Occurrence size (acres): 25.7

Description: Stands of the association are located on the west-facing slope above Jim Sage Canyon, upstream of the spring and on mid- to upper-slope positions of the west-facing slope of the central ridge within the site. An additional stand is located on the west-facing slope adjacent the eastern boundary of the site.

Occurrence rank and justification: 'AB'. The size is moderate (> 20 but < 40 acres, 'B Rank'). The landscape context is intact, native vegetation ('A Rank'). The condition is excellent. Native bunch grass interspace cover is abundant and exotic grass species are absent or only present. Stands are dominated by medium- to large-sized, old trees. Due to the moderate size, the overall rank is assessed as 'AB'.

Observation information: Stands of the association were identified by Joe Durfee (Burley District), Edwin Tisdale, and Steve Ciacco (Idaho Natural Areas Coordinating Committee) on June 17, 1983. Steve Rust collected ecological and environmental data within three stands of the occurrence on July 19 - 21, 1996. The plot id's are: 96051, 96061, and 96062. The average cover of vegetative components is: trees, 34; shrubs, 20; herbs, 8; grass, 49; moss and lichen, 1; and substrate components: rock, 15; gravel and soil, 19.

WEST FORK MINK CREEK RNA

Occurrence size (acres): 43.2

Description: JUOS/ARAR/AGSP occurs on mid- to upper-slope positions on south- to west-facing slopes of the southwest-trending ridge spurs of Slate Mountain. Substrates are loessal colluvium with patches of talus. Dense tree clusters are closely associated with rock outcrops. Some evidence of fire is present in stands immediately above West Fork Mink Creek.

Occurrence rank and justification: 'AB'. The size is large. The landscape context is predominantly intact stands of native vegetation. The condition of stands is primarily excellent, however, portions have been invaded by exotic grass species. On two of the four plots sampled within the occurrence, the cover of exotic annual grass species was > 1 percent.

Observation information: R. Kline reported the juniper woodlands in his establishment record dated March 8, 1973. Steve Rust visited the site on August 31, 1996 and collected data for the association on 4 ecology plots located on the western slope of Slate Mtn. Plot id's are: 96163, 96165, 96169, and 96171. The average percent cover of vegetative components is (considering native species only): trees, 21.6; shrubs, 21.1; herbs, 14.1; grass, 30.2; moss and lichen, 1.6; and substrate components: rock, 23.8; gravel and soil, 7.3. Stem densities for large-sized trees and greater is 15 tpa (all old); medium trees and poles, 53 (medium trees are mixed old and mature, poles are mature); and saplings and seedlings, 7.5 (all mature).

CONSERVATION STATUS

Threats and trends in viability--The association appears to be resistant to natural episodic disturbance events (e.g., low intensity fire). Chronic disturbance factors (e.g., excessive grazing) will alter understory species composition and may trigger long-lasting to irreversible changes in stand composition and structure. Livestock grazing, exotic species introductions, alteration of fire disturbance regimes, intensive range management (prescribed fire, chaining, exotic seeding, and water developments), and the combined cumulative effects, in and adjacent stands of this plant association are factors which effect the long-term viability of the plant association. Declining trends are suspected in approximately 12 - 24 percent of the stands sampled.

Knowledge of occurrences--The number of occurrences of the association is not known. Rust (1997) described the association on the basis of 24 plots located in the eastern portion of the Overthrust Mountains and the northern portion of the Northwest Basin and Range ecoregional section. Protected occurrences of the association are located in Gibson Jack RNA, Goose Creek Mesa RNA, Jim Sage Canyon RNA, and West Fork Mink Creek RNA.

Inventory work is needed throughout the expected range of the association to fully determine its distribution and abundance and the current condition of stands. Additional natural areas should be identified to provide representation of the association in the Cotterel Mountains, Sublett Range, or Deep Creek Mountains.

Summary: Global Rank: G2. The association appears common within a relatively limited range. Protected stands are partially degraded due to the introduction of exotic annual grass species. A declining trend in the condition of stands throughout the range is suspected due to livestock grazing, exotic species introductions, alteration of fire disturbance regimes, intensive range management activities, and the combined cumulative effects, in and adjacent stands of this plant association. Necessary inventory work has not been completed to assess the range-wide status association.

STEWARDSHIP and MANAGEMENT

Natural areas selection and design--Sites selected to provide representation of the association should encompass multiple first order drainage basins. Physical features which exclude access by livestock or provide strategic opportunities for easily maintained fencing should be considered. The condition of adjacent stands of vegetation and the vulnerability of the site to high intensity wildfire and exotic species invasion should also be considered.

Research and monitoring--Current research related to the association concerns classification and description of stand structure and composition and description of stand age structure. No monitoring is currently occurring in protected occurrences. Stands on intensively managed lands are probably being monitored but specific information is not known. Historic relationships between the natural disturbance regime, stand structure, and composition need to be determined. The percent cover of *Agropyron spicatum* and understory/interspace establishment of *Juniperus osteosperma* should be monitored using standard forest or range methods.

Management and restoration--High quality, representative stands are located within natural areas on NFS and BLM lands. No programs have been identified within these natural areas to maintain natural disturbance processes. Prescribed fire is being considered for the management and restoration of stands outside of these natural areas. The natural disturbance regime of the association has not been fully resolved. Fire has played an apparent role in maintaining stand structure and composition.

Potential for restoration of degraded stands depends largely on the potential to increase the abundance of *Agropyron spicatum* and other native bunch grass species. Fire may be a useful tool on moderately degraded sites. Unfortunately, once sites are severely degraded, fuel sufficient to carry fire at appropriate intensities (i.e., which do not cause mortality in large-sized trees) is absent. In stands where *Bromus tectorum* (or other exotic annual grass species) is abundant or if prescribed fire intensities are high, burning may result in favoring trends toward further degraded conditions (continued lose of understory bunch grass cover and increased understory establishment of *Juniperus osteosperma*). Chaining has also been used in attempts to restore degraded sites of similar associations. Chaining has the rather severe result of removing large, late-seral *Juniperus osteosperma*, while promoting the growth and establishment of young trees. As with fire, chaining may favor trends toward further degradation. To achieve effective restoration, sites require extended resting from livestock grazing; stocking levels should be reduced.

LITERATURE CITED

Grossman, D. H., K. L. Goodin, and C. L. Reuss, editors. 1994. Rare plant communities of the coterminous United States - an initial survey. Prepared for the USDI Fish and Wildlife Service. The Nature Conservancy, Arlington, VA. 620 pp.

Rust, S. K. 1997. Pinyon-juniper woodland classification and description in research natural areas of Southeast Idaho. Unpublished report prepared for USDI Bureau of Land Management, Burley Field Office and USDA Forest Service Northern Region, Intermountain Region and Intermountain Research Station. Conservation Data Center, Idaho Department of Fish and Game, Boise. 84 pp.

Record Maintenance:
Element code: CT0GADABN0
EGR Edition: 98-04-20, S. Rust
ES Edition: 1998-04-20, S. Rust
CCA Edition: 98-01-07, S. Rust

Appendix 4. Data Model - Ecology and Stewardship Reference Area Report. The relationships between BCD database files used in the *Ecology and Stewardship Reference Area Report* are schematically depicted. Each file in the database is represented by a box within the model. Sections of the report are indicated (e.g., "REFERENCE AREA CONDITIONS", etc.). Fields within each file are arranged to show their location within each of the sections of the report. One headed arrows indicate a one-to-one relationship; two headed arrows indicate a one-to-many relationship.

Appendix 5. Data Dictionary - Ecology and Stewardship Reference Area Report.

BCD fields utilized in the *Ecology and Stewardship Reference Area Report* are listed with brief descriptions by database file.

Community Characterization Abstract (CCA)

ADJACENT.COMMUNITIES (adjacent communities): The name(s) of other plant associations that are often adjacent to this community element with comments on their spatial relationships across the landscape.

DISTRIB.PATTERN (distribution pattern): A description of whether there are rare, patchy, or continuous occurrences across the landscape.

GENVIRO.COM (global environment comments): General comments on important environmental factors, including climate and other seasonal factors.

GKEY.ENVIRO.FACTORS (global key environmental factors): Environmental determinants of the biological composition or structure of this plant association or its phases.

GVEGETATION.COM (global vegetation comments): A summary description of the leaf type and phenology, physiognomy, and plant species composition of the plant association.

INCLUSION.COMMUNITIES (inclusion communities): The name(s) of other plant associations that frequently occur as inclusions within this plant association.

NAT.DISTURBANCE (natural disturbance regime): Comments on the type and duration of normally occurring natural disturbances on any scale particular to the plant association.

Element Global Ranking (EGR)

ELDESCRIP (element description): An informal one-line description of the association. The National Vegetation Classification formation (Federal Geographic Data Committee-Vegetation Subcommittee, 1996).

EOSPECS (element occurrence specifications): A description of the specifications for an occurrence of the plant association. Information concerning the following topics is provided:

- Is there more than one type of occurrence.
- How are occurrences of the association distributed within the range the association?
- Is there a clumped or patchy distribution that could create confusion about whether one or several occurrences are present at a site? If so, by what convention is that confusion consistently resolved?
- Definition of the minimum standards for size and condition.
- Description of how stand boundaries are determined.
- Mapping conventions for treating loose aggregations or discontinuous stands as a single occurrence.

Information in this field may affect ranks. If only outstanding occurrences qualify, the plant community element will have correspondingly fewer occurrences and thus its rank will rise. It is important to not artificially elevate one plant association relative to others in its class by requiring stringent occurrence specifications while others have lenient ones.

ARANKSPECS ("A" rank specifications): A description of what qualifies as an occurrence of the highest quality, taking into consideration what is known about the element historically (the best extant occurrence in the world may not rate an "A" element occurrence rank (see discussion under EORANK below). The main factors considered are size (acreage), type of disturbance (e.g. degradation by logging, grazing, invasion of exotics, and changes in

hydrology), and degree of disturbance.

BRANKSPECS ("B" rank specifications): A description of what qualifies as an occurrence of that rank, taking into consideration what is known about the element historically.

CRANKSPECS ("C" rank specifications): A description of what qualifies as an occurrence of that rank, taking into consideration what is known about the element historically.

DRANKSPECS ("D" rank specifications): A description of what qualifies as an occurrence of that rank, taking into consideration what is known about the element historically.

GESTEOSCOM (global estimated element occurrences comments): Comments on the estimated current and historic occurrences globally. Actual numbers, degree of confidence, the extent of field surveys, and historic changes should be discussed. The viability and condition (percentage of occurrences by EORANK) may be discussed. This field is coupled with a field that provides a coded estimate of global estimated occurrences (GESTEOS). Values are: A = 0 - 5, B = 6 - 20, C = 21 - 100, D = 101+. The estimated number of occurrences is the most important single factor influencing the global conservation rank (see discussion of GRANK below) when there are few known occurrences. If the association is rated as A or B, it will inevitably qualify for a G1 or G2 rank.

GABUNDCOM (global abundance comments): Comments on the abundance of the plant association. Discussion of ambiguities and complications in estimating the abundance should be included. This field is coupled with a field that provides a coded estimate of global abundance (GABUND). Values are: A = < 2,000 acres or fewer than 10 miles of stream length; B = 2,000 - 10,000 acres or 10 - 50 miles; C = 10,000 - 50,000 acres or 50 - 250 miles; D = > 50,000 acres or over 250 miles.

GRANGECOM (global range comments): A description of the distribution (present and historic) of the plant association. This field is coupled with a database field (GRANGE) that recognizes the following global range classes: A = narrow endemic (less than 100 square miles); B = regional endemic (100-10,000 sq. miles); C = moderately widespread or widespread with spotty distribution (10,000-1,000,000 sq. miles); D = widespread (greater than 1,000,000 sq. miles).

GTRENDCOM (global trend comments): Comments concerning trends in the global distribution of the plant association. This field is coupled with a database field (GTREND) that recognizes the following global trend classes: A = declining rapidly; B = declining; C = stable; D = increasing.

GPROTCOM (global protected comments): Comments on the current protection status of the plant association. This field is coupled with a database field (GPROTEOS) that recognizes the following size classes for the number of protected occurrences: A = none protected; B = one; C = several; D = many; U = unknown whether any occurrences are protected.

GTHREATCOM (global threat comments): A description of global threats. This field is coupled with a database field (GTHREAT) that recognizes the following characterizations of global threats: A = Very threatened range-wide; the association is directly exploited or threatened by natural or man-made forces. B = Moderately threatened range-wide; the plant association lends itself to alternate use. C = Not very threatened range-wide; self-protecting by unsuitability for other uses. D = Not threatened on a range-wide basis, although it may be threatened in minor portions of the range.

GFRAGILCOM (global fragility comments): Comments on the fragility of the plant association. This field is coupled with a database field (GFRAGIL) that recognizes the following classes: A = extremely fragile; B = fragile; C = fairly resistant; D = tough.

GREASONS (global reasons): An explanation of the reasons for the assignment of the current GRANK (see description below), discussing key ranking variables and other considerations used.

GRSRCHNEED (global research needs): A prioritized list of the research needed concerning the ecology of the plant association.

GINVENNEED (global inventory needs): A summary of the inventory needs of the association. Comments concerning the relative completeness of the knowledge of existing occurrences and where additional occurrences may be located.

GPROTNEED (global protection needs): A summary of the most important protection needs for the association at the global level.

Element Occurrence Record (EOR)

EODATA (element occurrence data): A summary of data collected on the plant association occurrence.

EOTYPE (element occurrence type): This field provides a standardized classification of the seral status and structural condition of the occurrence.

EORANK (element occurrence rank): A code for the rank of the plant association occurrence. The element occurrence rank is assigned on the basis of recent field work by a knowledgeable ecologist. Criteria for assigning occurrence ranks are identified for each plant association in the element occurrence rank specification fields (i.e., ARANKSPECS, BRANKSPECS, CRANKSPECS, and DRANKSPECS) in the EGR file (see above). Traditionally the following factors (or their combinations) are considered: 1) quality - the representativeness of the occurrence especially as compared to element occurrence specifications; 2) condition - how much has the site and the element occurrence itself been damaged or altered from its optimal condition and character; 3) viability - the long-term prospects for continued existence of the occurrence; and 4) defensibility - the extent to which the occurrence can be protected from extrinsic human factors that might otherwise degrade or destroy it.

In an alternative approach (The Nature Conservancy et al. 1997) size is recognized as a primary factor. Quality and condition are integrated into on factor (condition): an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. The notion of defensibility is replaced with landscape context: an integrated measure of the quality of biotic and abiotic factors, structures, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the occurrence. Viability is viewed as the summation of these three factors.

EORANKCOM (element occurrence rank comments): Comments justifying the element occurrence rank assigned in the EORANK field.

GENDESC (general description): A general description of the occurrence. Basic descriptive data concerning structure and composition are included in a narrative form.

SIZE (size): The size of the plant association occurrence (in acres).

Element Stewardship (ES)

STEW.SUM (stewardship summary): A general summary of the stewardship and management concerns for the plant association.

RESTOR.POTENTL (restoration potential): A description of the potential for restoration or recovery of the plant association from a degraded state.

PSD.CONSID (preserve selection and design considerations): A description of the factors that should be considered

when selecting and designing a natural area to provide representation of the plant association.

MGMT.REQS (management requirements): A description of currently recommended management procedures and needs to maintain high quality occurrences of the association.

MGMT.PROG (management programs): A description of any known management programs for the plant association.

MONIT.REQS (monitoring requirements): A description of currently recommended monitoring procedures and needs for the plant association.

MONIT.PROG (monitoring programs): A description of known monitoring programs for the plant association.

MGMT.RSRCH.PROG (management research programs): A description of known management research programs for the association (including a discussion of questions being studied, methods used, key contacts, etc).

MGMT.RSRCH.NEED (management research needs): A description of current management research needs for the plant association.

Element Tracking (ET)

GRANK (global rank): The global rank for the element, is assigned on the basis of standardized definitions and rules.

SNAME (state name): The name of the plant association as recognized in the state using standard scientific nomenclature.

STAXCOM (state taxonomy comments): Notes are provided concerning similar plant associations.

Site Basic Record (SBR)

SITENAME (site name): The name of the site. Each site is assigned a unique name. Once assigned, the name should not change unless absolutely necessary. This will ensure consistency and better communication among cooperators. The following conventions are applied: 1) element names are not used, 2) local place names are used first when available, 3) names of features on topographic maps are used when local names do not exist, and 4) to avoid confusion, no two sites within the state are given the same name.

DESIG.CODE (designation code): A code for the type or status of the conservation site of natural area. For example, RNA for research natural area; PRNA for proposed research natural area.

Source Abstract (SA)

CITATION (citation): The citation of literary sources cited.

Appendix 6. Report Structure - Ecology and Stewardship Reference Area Report. The BCD merge form for the *Ecology and Stewardship Reference Area Report* is summarized. This shows the location of the fields summarized in Appendices 4 and 5 and reported in Appendices 1 - 3.

Ecology and Stewardship
Reference Area Report

{SNAME}
{ELDESCRIP}

ECOLOGY and CLASSIFICATION

Distribution--{GRANGECOM} {GABUNDCOM} {STAXCOM}

Vegetation--{GVEGETATION.COM}

Environment--{GKEY.ENVIRO.FACTORS} {GENVIRO.COM} {DISTRIB.PATTERN}
{ADJACENT.COMMUNITIES} {INCLUSION.COMMUNITIES}

{NAT.DISTURBANCE}

Information Needs--{GRSRCHNEED}

REFERENCE STAND CONDITIONS

Occurrence specifications--{EOSPECS}

'A' Rank Descriptions--{ARANKSPECS}

'B' Rank Descriptions--{BRANKSPECS}

'C' Rank Descriptions--{CRANKSPECS}

'D' Rank Descriptions--{DRANKSPECS}

Exemplary reference occurrences:

{SITENAME} {DESIG.CODE}
Occurrence type: {EOTYPE}
Occurrence size (acres): {SIZE}
Description: {GENDESC}
Occurrence rank and justification: '{EORANK}'. {EORANKCOM}
Observation information: {EODATA}

CONSERVATION STATUS

Threats and trends in viability--{GFRAGILCOM} {GTHREATCOM} {GTRENDCOM}

Knowledge of occurrences--{GESTEOSCOM} {GPROTCOM} {GINVENNEED} {GPROTNEED}

Summary: Global Rank: {GRANK}. {GREASONS}

STEWARDSHIP and MANAGEMENT

Natural areas selection and design--{PSD.CONSID}

Research and monitoring--{MGMT.RSRCH.PROG} {MONIT.PROG} {MGMT.RSRCH.NEED} {MONIT.REQS}

Management and restoration--{MGMT.PROG} {MGMT.REQS} {RESTOR.POTENTL}

Summary--{STEW.SUM} (if needed)

LITERATURE CITED

{CITATION}

Record Maintenance:
Element code: {ELCODE}
EGR Edition: {EDITION}, {EDAUTHOR}
ES Edition: {ES.EDITION}, {ES.EDAUTHOR}
CCA Edition: {CCA.EDITION}