STOLLER-ESER-73

Sagebrush Steppe Ecosystem Reserve Plant Community Classifications

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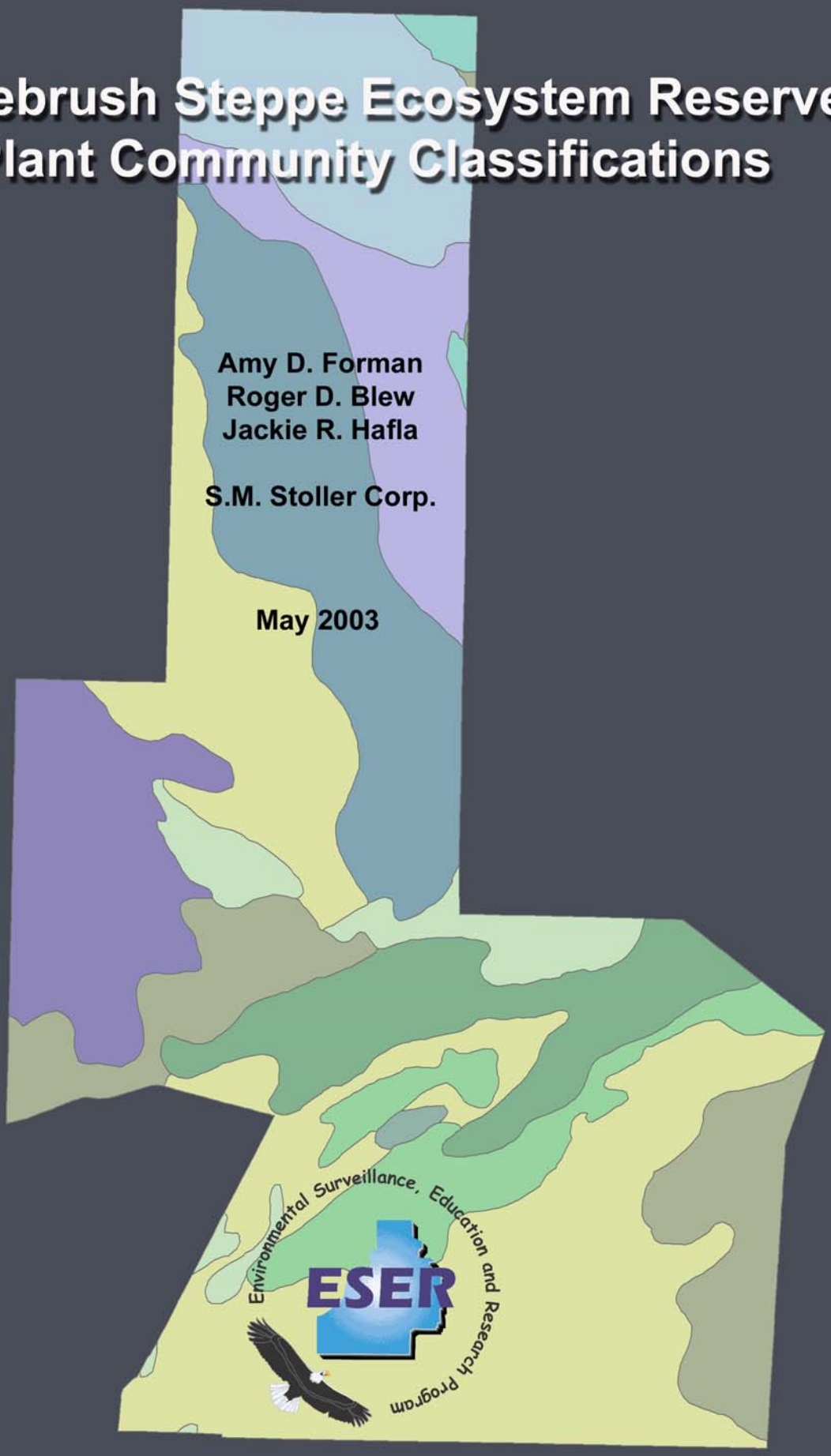
May 2003



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INTRODUCTION

A map of the plant communities of the Sagebrush Steppe Ecosystem Reserve (SSER) was created to support the SSER Management Plan Environmental Assessment. Vegetation community classes and the associated polygons for the vegetation map of the SSER were compiled primarily from three sources that described distinct community types encompassed within the larger, more general sagebrush steppe ecosystem on the INEEL. The references used to describe the vegetation classes and create the vegetation map include *Plant Communities, Ethnoecology, and Flora of the Idaho National Engineering Laboratory* by Anderson et al. (1996), *Vegetation Types and Surface Soils of the Idaho National Engineering Laboratory Site* by McBride et al. (1978), and *Vegetation Studies to Support the NPR Environmental Impact Statement* by Anderson (1991). Polygons from the McBride et al. (1978) map were used to delineate major vegetation communities; however vegetation classes in each polygon were described using more recent plant community classifications by Anderson et al. (1996). Two new vegetation types that were not described as distinct classes in Anderson et al. (1996) were also described for the Reserve as part of this study.

Vegetation data were collected on the Reserve in late summer and fall of 2002 and were analyzed using multivariate techniques. These data, in conjunction with data from the sources listed above and data from BLM monitoring plots were used to assign each polygon to a vegetation class. A single vegetation class was assigned to many of the polygons on the McBride et al. (1978) map; however, a combination of two vegetation classes was assigned to some polygons. A combination of two vegetation classes in a single polygon denotes a complex of two vegetation types that form heterogeneous patches within the area represented by the polygon. The 2002 vegetation data were also used to tailor the Anderson et al. (1996) vegetation class community descriptions to the plant communities on the Reserve, and to provide more detailed descriptions of polygons labeled as complexes. Species nomenclature follows the National PLANTS Database (2002).

METHODS

Vegetation Surveys

Vegetation data were collected in August of 2002. Twenty-eight plots were surveyed for relative species abundance. The plots were distributed across several polygons delineated by the McBride et al. (1978) vegetation map. Plot distribution was stratified such that polygons that previously had relatively broad, somewhat ambiguous vegetation class descriptions were sampled more intensely than polygons for which vegetation class descriptions were well defined.

Plots consisted of a 100-m long by 20-m wide belt transect. Each plot was surveyed for a relatively complete species list. An exhaustive species list was not practical due to the late season during which data were collected. Each species in each plot was ranked on a relative abundance scale according to the dominance of that species compared to the dominance of other

species present in a given plot. The abundance ranking scale used for vegetation sampling is shown in Table 1. Photo plots were also established and photos taken for each plot surveyed.

Table 1. Ranking system used for vegetation plot surveys.

Rank	Description
1	Dominant or co-dominant.
2	Abundant; comprising a substantial portion of live plant cover, but not dominant.
3	Common; easily found but not contributing a large portion of plant cover.
4	Rare, only a few individuals found within the plot.

Data Analysis

Data were analyzed using Bray-Curtis ordination. Bray-Curtis ordination is a polar ordination technique that determines how similar or dissimilar vegetation plots are based on the relative abundance of each species within each plot. We would expect that plots within the same polygon or vegetation class would be more similar than plots within different polygons or vegetation classes. A species by plot ordination matrix was established by reversing the original species ranks (i.e. a rank of 1 becomes a rank of 4 and a rank of 4 becomes a rank of 1) and raising the new ranks to the power of two. Data were transformed in this manner because the ordination technique used recognizes species with larger numbers as a relatively more abundant component of the plant community, and the most abundant species in a plot is typically several times more abundant than the least abundant species.

RESULTS AND DISCUSSION

Ordination

Initially, vegetation data were analyzed for dominant and co-dominant tree, shrub and grass species in each plot within each polygon. Some polygons were clearly recognizable as distinct vegetation classes because the plots in them always had the same dominant and co-dominant species, and those dominant and co-dominant species were rarely shared with plots from other polygons. The vegetation classes represented in these polygons included juniper woodlands and grasslands. The plots surveyed in polygons representing these two vegetation classes were removed from further analysis.

Many of the remaining polygons contained dominant and co-dominant shrub and grass species that differed among plots within those polygons. Additionally, plots from different polygons occasionally had similar dominant and co-dominant species. This result was not unexpected since native plant communities, like most natural resources, are generally continuously variable across the landscape. However, vegetation classes can be delineated within larger plant communities as areas, at a landscape scale, that generally have the same species with the same relative abundances. For example, a plant community in a sagebrush/rabbitbrush vegetation class may be dominated by sagebrush or rabbitbrush, or it may be co-dominated by both at the scale of a vegetation plot. However, across the landscape the two species occur with the same abundance relative to one another in the plant community. As with the sagebrush/rabbitbrush vegetation class, a plant community in the sagebrush steppe vegetation

class will also have vegetation plots dominated by sagebrush; however, across the landscape, rabbitbrush will have a much lower abundance relative to sagebrush than it would in a plant community in the sagebrush/rabbitbrush vegetation class.

Therefore, the remaining polygons were assigned a vegetation class based on the rankings of the species surveyed in the vegetation plots within each polygon. Because the plots within some polygons had a unique pattern of species dominance, not present in other polygons, a new vegetation class, low sagebrush, was used to describe some polygons. A Bray-Curtis polar ordination was performed on the plots within the remaining polygons to determine how similar plots within a polygon or multiple polygons within the same vegetation class were, and whether plots within the same vegetation class were substantially different from plots in other vegetation classes. The results of polar ordinations are typically plotted along three, unitless axes. The results of the ordination of the SSER vegetation data are shown as three, two-dimensional, pairwise comparisons in Figure 1. Plots that occurred in one or more polygons assigned to the same vegetation class are represented by the same letter; numbers simply identify one plot from another within a vegetation class.

Results from the ordination support the creation of the low sagebrush vegetation class. Anderson et al. (1996) grouped the low sagebrush and sagebrush steppe vegetation classes together into the sagebrush steppe vegetation class. However, the first two axes of the polar ordination (Figure 1a.) shows plots from polygons assigned to the low sagebrush vegetation class (denoted by the letter G) generally separating out into a different cloud than plots from polygons assigned to the sagebrush steppe vegetation class (denoted by the letter C), indicating substantial differences in the composition and abundance of species within those polygons.

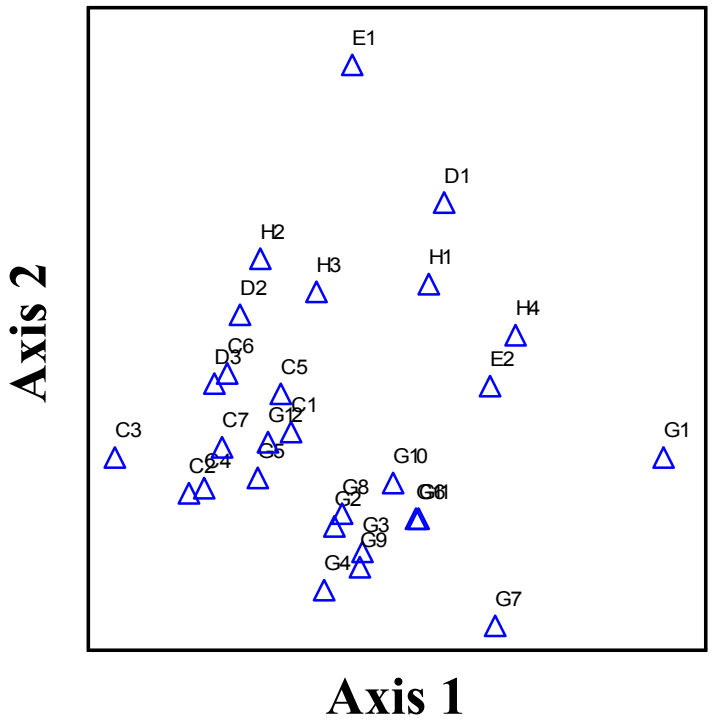

Figure 1a. Bray-Curtis polar ordination Axis 1 vs. Axis 2 for vegetation plots on the Sagebrush Steppe Ecosystem Reserve. Letters denote plots assigned to the same vegetation class.

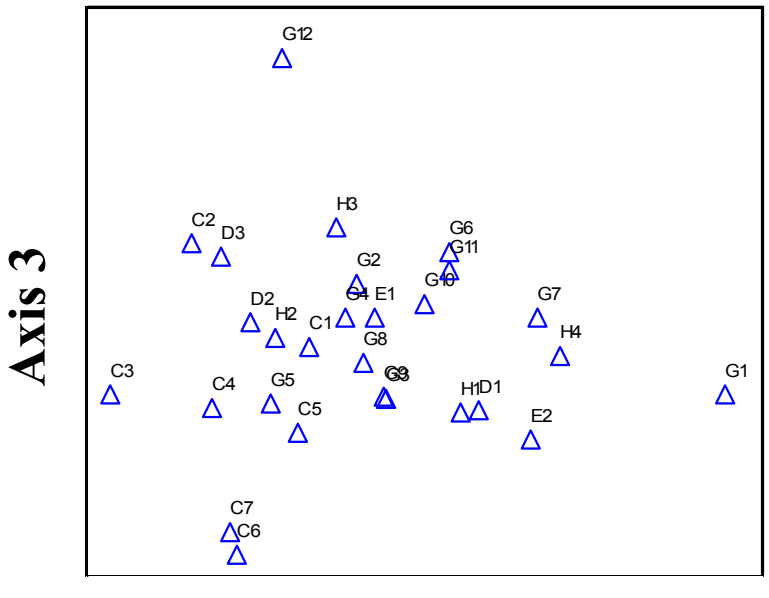

Figure 1b. Bray-Curtis polar ordination Axis 1 vs. Axis 3 for vegetation plots on the Sagebrush Steppe Ecosystem Reserve. Letters denote plots assigned to the same vegetation class.

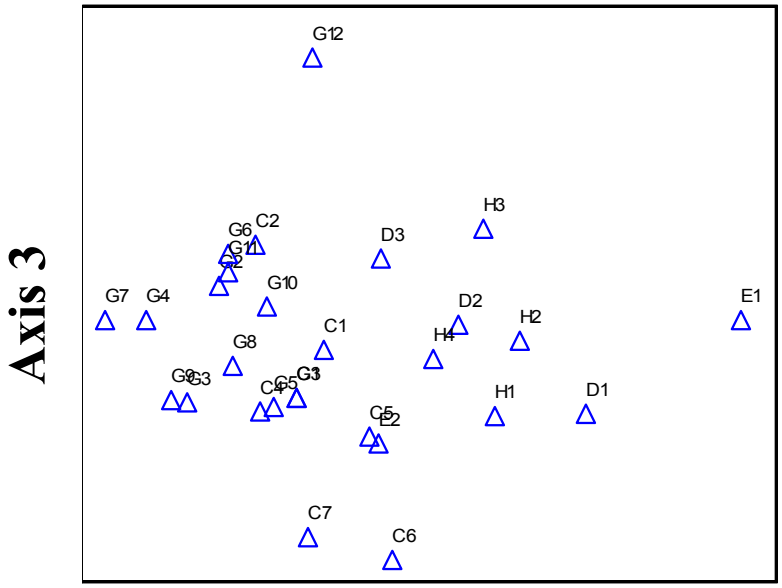

Figure 1c. Bray-Curtis polar ordination Axis 2 vs. Axis 3 for vegetation plots on the Sagebrush Steppe Ecosystem Reserve. Letters denote plots assigned to the same vegetation class.

Two of the three pairwise comparisons also indicate that the plots in the sagebrush/rabbitbrush vegetation class (denoted by the letter H) are generally more similar to one another than to plots assigned to other vegetation classes. Two vegetation classes did not form discrete clouds within the polar ordination, sagebrush/winterfat, and salt desert shrub, indicating that they did not constitute distinct plant communities. Species compositions and abundances from data collected for this project, species biomass from BLM monitoring data, and several visits to the polygons in question prompted us to add an additional vegetation class, sagebrush/Atriplex. This vegetation class is characterized by the co-dominance of sagebrush and saltbush, and better described some communities with plots that were originally assigned to salt desert shrub or sagebrush/winterfat communities. Finally, we reassigned some polygons as complexes between the sagebrush/Atriplex vegetation class and another vegetation class to adequately represent the patchiness of the vegetation in those polygons for which vegetation classes were not clearly differentiated in the polar ordination.

The final map for the SSER is shown in Figure 2, and the vegetation class descriptions follow.

Vegetation Class Descriptions

Juniper Woodlands. Communities in this class are characterized by the dominance of Utah juniper (*Juniperus osteosperma)*. Utah juniper may occur co-dominantly with Wyoming big sagebrush (*Artemisia tridentata* ssp. w*yomingensis*) or black sagebrush (*Artemisia nova*) within this vegetation type. However, the presence of a single species association cannot be inferred from the presence of Utah juniper. Thus, occasionally neither Wyoming big sagebrush nor black sagebrush occurs with Utah juniper, but native grasses may be abundant in the understory.

Additional shrub species that may be common within this vegetation class include green rabbitbrush (*Chrysothamnus viscidiflorus*), shrubby buckwheat (*Eriogonum microthecum*), and prickly phlox (*Leptodactylon pungens*). Typical understory grasses include Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread grass (*Hesperostipa comata*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Indian ricegrass and needle-and-thread grass tend to be common understory grasses in lower elevation juniper communities near transitions from sagebrush steppe communities to juniper woodlands. Bluebunch wheatgrass becomes much more prevalent in the understory with increasing elevation. Forbs common to this community class include arrowleaf balsamroot (*Balsamorhiza sagittata*), tapertip hawksbeard (*Crepis acuminata*), Hood's phlox (*Phlox hoodii*), and ballhead gilia (*Ipomopsis congesta*).

Grasslands. Communities within this vegetation class may vary considerably by species composition; however, they are all dominated by perennial grasses. Native grassland communities may be dominated by rhizomatous species, bunchgrasses, or a combination of both. Thick-spiked wheatgrass (*Elymus lanceolatus*), western wheatgrass (*Pascopyrum smithii*), creeping wildrye (*Leymus triticoides*), and Douglas' sedge (*Carex douglasii*) are common dominant rhizomatous species. Bunchgrass species that may dominant or co-dominate grasslands include Great Basin wildrye (*Leymus cinerus*), Indian ricegrass, bottlebrush squirreltail (*Elymus elymoides*), needle-and-thread grass, Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass. Grasslands in the SSER are most often dominated by needle-and-thread grass and/or Indian ricegrass with thick-spiked wheatgrass occurring very frequently. Grasslands may also include crested wheatgrass (*Agropyron cristatum*) seedings.

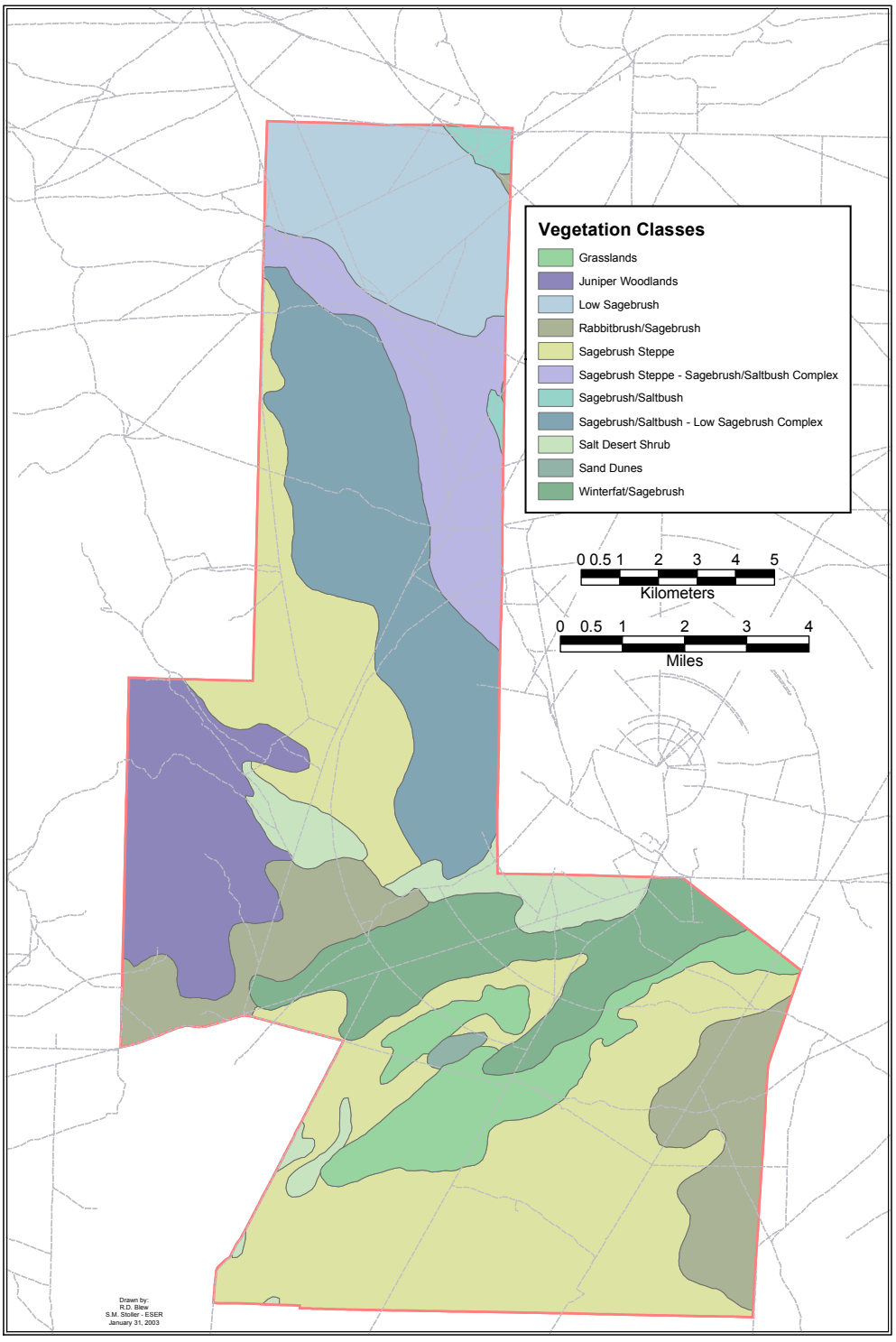

Figure 2. Plant community map with vegetation classifications for the Sagebrush Steppe Ecosystem Reserve.

Shrubs often occur within grassland communities; however, shrub cover is generally sparse. Shrub species that frequently occur within this vegetation class include black sagebrush, Wyoming big sagebrush, Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), green rabbitbrush, and prickly phlox. Gray horsebrush (*Tetradymia canescens*) and shrubby buckwheat may also occur sporadically within grassland communities. Pricklypear (*Opuntia polyacantha*) is often locally abundant. Forbs that typically occur in Reserve grasslands include whitestem globemallow (S*phaeralcea munroana*), whitestem blazingstar (*Mentzelia albicaulis*), western tansymustard (*Descurainia pinnata*), and western stickseed (*Lappula occidentalis*). A number of alien species may also be common within this vegetation type.

Sagebrush Steppe. Sagebrush steppe communities on the SSER are generally dominated by Wyoming big sagebrush; however, they are occasionally dominated by basin big sagebrush, and may even be co-dominated by both subspecies. Communities dominated by basin big sagebrush often occur as patches within extensive stands of Wyoming big sagebrush. The distribution and abundance of these two subspecies is related to soil depth and texture. Basin big sagebrush tends to dominate on deep, well drained, sandy soils, such as soils found on the lee side of lava ridges where sand accumulates. Basin big sagebrush is also abundant in and around stream channels on the SSER. Conversely, Wyoming big sagebrush tends to dominate on fine-textured shallow soils.

Native perennial grasses are typically more abundant in the understory of Wyoming big sagebrush communities than they are in the understory of basin big sagebrush communities. Aside from differences in grass abundance, both community types can have similar understory species compositions; however, species composition in the understory of big sagebrush stands may be quite varied, as a single association of species cannot be predicted in communities dominated by big sagebrush. Common understory grasses include thick-spiked wheatgrass, Indian ricegrass, needle-and-thread grass, and Sandberg bluegrass. Green rabbitbrush, winterfat (*Krascheninnikovia lanata*), prickly phlox, and spiny hopsage (*Grayia spinosa*) are frequently occurring shrubs within the sagebrush steppe community type. Green rabbitbrush and winterfat can be quite locally abundant in SSER sagebrush steppe communities. Shadscale (*Atriplex confertifolia*) may also occur occasionally in low densities. Pricklypear may be locally abundant, and common forbs include fernleaf biscuitroot (*Lomatium dissectum*), basalt milkvetch (*Astragalus filipes*), Hood's phlox, and hoary aster (*Machaeranthera canescens*).

Winterfat/Sagebrush. The vegetation in this community class is either dominated by winterfat, or co-dominated by winterfat and Wyoming big sagebrush. Green rabbitbrush occurs frequently within this vegetation type, and gray horsebrush occurs sporadically, but may become locally abundant. Spiny hopsage may also occur occasionally within this classification. Perennial grasses are frequently abundant in winterfat/sagebrush communities, especially Indian ricegrass. Additional common grasses include thick-spiked wheatgrass and bottlebrush squirreltail. Within this community, Hood's phlox and hoary aster are some of the most frequently occurring forbs.

Salt Desert Shrub. Three distinct salt desert shrub community types are found within the Sagebrush Steppe Ecosystem Reserve. All three community types occur on playas within the Lake Terreton drainage. Thus, all three types are characterized by a high percentage of bare ground, and members of the chenopod family dominate them all. Winterfat is an important component of all salt desert shrub communities on the Reserve. Otherwise, species compositions of these three community types can vary considerably.

The first salt desert shrub community type is dominated by Nuttall's saltbush (*Atriplex nuttallii*). Shrubby buckwheat and winterfat are common and either species may frequently be co-dominant. Indian ricegrass and bottlebrush squirreltail often occur within this vegetation type, and Wyoming big sagebrush and thick-spiked wheatgrass may be locally abundant, but not dominant.

The second type of salt desert shrub community is dominated by shadscale. Winterfat and green rabbitbrush are common within this vegetation type. Indian ricegrass may be abundant, and Nuttall's saltbush occurs occasionally. Spiny horsebrush, greasewood (*Sarcobatus vermiculatus*), and western wheatgrass also occur sporadically within this community.

The third community type classified as salt desert shrub is co-dominated by fourwing saltbush (*Atriplex canescens*) and winterfat. This vegetation type covers a relatively minor area within the salt desert shrub classification. Low perennial grass and forb cover characterize this community.

Sagebrush/Saltbush. This vegetation class represents communities in which sagebrush species dominate and salt desert shrub species are ubiquitous. This community differs from the sagebrush steppe vegetation class because of the relatively high abundance salt desert shrub species. Wyoming big sagebrush is always a dominant species, and black sagebrush or low sagebrush (*Artemisia arbuscula*) may be co-dominant sagebrush components of this vegetation type and are usually always present. Shadscale is typically the most common salt desert shrub species in this vegetation class. Winterfat may also be quite abundant within this community type. Additional shrubs that commonly occur within the sagebrush/saltbush community include green rabbitbrush, and fourwing saltbush. Indian ricegrass is nearly always present within this community, and needle-and-thread grass and bottlebrush squirreltail may be locally abundant.

Low Sagebrush. Low sagebrush vegetation types are sagebrush steppe communities characterized by the dominance of low sagebrush, black sagebrush, or occasionally, a combination of both. These communities are most often dominated by low sagebrush. Although both species occur on shallow soils, black sagebrush tends to become a dominant only on lava ridges. Wyoming big sagebrush, shadscale, and green rabbitbrush commonly occur and may be locally abundant in many of these communities. Additional shrubs that occur regularly within this vegetation type include winterfat, broom snakeweed (*Gutierrezia sarothrae*), and prickly phlox.

Most low sagebrush communities have an abundance of native perennial bunchgrasses and forbs. Bottlebrush squirreltail and Indian ricegrass are typically quite abundant throughout this vegetation type. Furthermore, needle-and-thread grass, bluebunch wheatgrass, and Sandberg bluegrass are common in these communities. Indian ricegrass and needle-and-thread grass occur frequently at lower elevations, and bluebunch wheatgrass becomes prevalent with increasing elevation. Pricklypear distribution is widespread within low sagebrush communities, and forbs common to these communities include Hood's phlox, northwest Indian paintbrush (*Castilleja angustifolia*), and shaggy fleabane (*Erigeron pumilus*).

Rabbitbrush/Sagebrush. Dominated by green rabbitbrush or co-dominated by green rabbitbrush and Wyoming big sagebrush, these communities can have a rich understory of perennial grasses and forbs. Winterfat occurs frequently within this vegetation type, and gray horsebrush occasionally becomes locally abundant. Common grasses in this community type include needle-and-thread grass, thick-spiked wheatgrass, and bottlebrush squirreltail. Great Basin wildrye may be locally abundant, and Indian ricegrass occurs regularly, but usually in low

densities. Forbs that frequently occur in sagebrush/rabbitbrush communities include Hood's phlox, ballhead gilia, Wilcox's woollystar (*Eriastrum wilcoxii*), Torrey's milkvetch (*Astragalus calycosus*), hoary aster, and Douglas' dustymaiden (*Chaenactis douglasii*).

Sand Dunes. The polygon designated as sand dunes has sparse vegetative cover. Most plant cover results from annuals such as Russian thistle (*Salsola kali*) and tall tumble mustard (*Sisymbrium altissimum*). Indian ricegrass also occurs intermittently at low densities.

Vegetation Complexes

Sagebrush Steppe – Sagebrush/Saltbush Complex. A complex of the sagebrush steppe and sagebrush/saltbush vegetation classes occurs along the area associated with the channels of the Birch Creek drainage. Sagebrush steppe communities within this complex are primarily dominated Basin big sagebrush and occur in deep soils associated with channels. Sagebrush/saltbush communities within this complex are dominated by Wyoming big sagebrush and have an abundance of shadscale, and low sagebrush is often present.

Sagebrush/Saltbush – Low Sagebrush Complex. The landscape in the polygon labeled as a sagebrush/saltbush and low sagebrush complex is characterized by a basaltic flow that has had subsequent loess accumulation and soil formation. The low sagebrush communities occur on and around exposed basalt outcrops, and are dominated by black sagebrush. The sagebrush/saltbush vegetation class, in which Wyoming big sagebrush dominates and shadscale and low sagebrush are abundant, typifies the lower lying areas.

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