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Vegetation Database for Land-Cover Mapping, Clark and Lincoln Counties, Nevada

Data Series 827

U.S. Department of the Interior
U.S. Geological Survey

Pleuraphis rigida Shrub Herbaceous Alliance at sample 5228 in Red Rock Canyon National Conservation Area.

Ferocactus cylindraceous Limestone Bedrock Shrubland Alliance at sample 2004 in Coyote Springs Area of Critical Environmental Concern.

Yucca schidigera-Larrea tridentata-Ambrosia dumosa Wooded Shrubland Alliance at sample 5039 near Red Rock Canyon National Conservation Area.

Acacia greggii Intermittently Flooded Shrubland Alliance at sample 1999 in Piute-Eldorado Valley Area of Critical Environmental Concern.

Cover. *Larrea tridentata-Ambrosia dumosa* Shrubland Alliance at sample 1843 in Mormon Mesa Area of Critical Environmental Concern. All photos taken by David A. Charlet.

Vegetation Database for Land-Cover Mapping, Clark and Lincoln Counties, Nevada

By David A. Charlet[1], Nancy A. Damar, and Patrick J. Leary[1]

[1]American West Ecology

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
SALLY JEWELL, Secretary

U.S. Geological Survey
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U.S. Geological Survey, Reston, Virginia: 2014

Suggested citation:
Charlet, D.A., Damar, N.A., and Leary, P.J., 2014, Vegetation database for land-cover mapping, Clark and Lincoln Counties, Nevada: U.S. Geological Survey, Data Series 827, 18 p., *http://dx.doi.org/10.3133/ds827*

ISSN 2327-638X (online)

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SI to Inch/Pound

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
meter (m)	1.094	yard (yd)
	Area	
square meter (m^2)	0.0002471	acre

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviations

ACEC	Area of Critical Environmental Concern
BLM	Bureau of Land Management
DNWR	Desert National Wildlife Refuge
GIS	geographic information system
GPS	Global Positioning System
RRCNCA	Red Rock Canyon National Conservation Area
NVC	National Vegetation Classification
RACE	rapid assessment community ecology
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

Acknowledgments

Many College of Southern Nevada students contributed to the field data collection effort. Jeremy Chambers, Toni Leufven, Drew Pearson, Tim Schelz, Dagny Signorelli, and Tamara Wynn all made significant contributions that we greatly appreciated. Angela Pitt, Fred Landau, Phoenix King, and Jennifer Leary worked hard in the field in all kinds of weather conditions to put together a good data set for Red Rock Canyon. Doug Merkler was of tremendous assistance with soils information and field coordination. Craig Westenburg was essential to virtually every aspect of the work.

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Abstract

Floristic and other vegetation data were collected at 3,175 sample sites to support land-cover mapping projects in Clark and Lincoln Counties, Nevada, from 2007 to 2013. Data were collected at sample sites that were selected to fulfill mapping priorities by one of two different plot sampling approaches. Samples were described at the stand level and classified into the National Vegetation Classification hierarchy at the alliance level and above. The vegetation database is presented in geospatial and tabular formats.

Introduction

In 2006, the U.S. Geological Survey (USGS), in cooperation with the Bureau of Land Management (BLM), began a study to map land cover in Red Rock Canyon National Conservation Area (RRCNCA; fig. 1). The geographic extent of the study was expanded in 2010 to include three BLM Areas of Critical Environmental Concern (ACEC) in Clark County: Coyote Springs, Mormon Mesa, and Piute-Eldorado Valley (fig. 1). The study produced high-resolution, detailed land-cover data sets by using a combination of floristic data collected on the ground and remote-sensing classification techniques on high-resolution satellite imagery (Smith and others, 2014).

These data are from 3,175 specifically selected sample sites. Data were collected by using two different plot sampling methods from 2007 to 2013. Sampling by either method identified a homogenous plant community at the stand level. All sample sites were described with a stand name, in which any species that occupied 5 percent or greater cover in any canopy layer was identified. Samples were then assigned to the National Vegetation Classification Standard (NVC) at the alliance level and above (Federal Geographic Data Committee, 2008).

Concurrent Data Collection

During the study period, the field team also collected vegetation data for a county-wide ecosystem geographic information system (GIS) modeling effort known as the "Ecosystem Indicators" project for the Clark County Multiple Species Habitat Conservation Plan (Heaton and others, 2011). The team also was contracted to collect vegetation data in Desert National Wildlife Refuge (DNWR; fig. 1) in Clark and Lincoln Counties, Nevada, for a U.S. Fish and Wildlife Service mapping project (Westenburg and Charlet, 2013). Throughout the study period, data from all efforts were provided as a courtesy for all studies.

The products from these efforts vary in scale, resolution, and detail, but the vegetation data were collected to a consistent standard. All locations sampled by the field team were included in the database for completeness.

Purpose and Scope

The vegetation data were collected to be used as input for GIS and remote-sensing software programs. These programs use known ground conditions to analyze spectral data from satellite imagery in order to make predictions about ground conditions in locations for which there are no ground data. Therefore, the purpose of the data collection was to describe existing ground conditions as well or better than could be discerned through spectral analysis. Sample sites were selected to fulfill this purpose, so no inferences about overall patterns and distributions of vegetation can be made from these data alone.

The purpose of this report is to describe the methods used to collect and classify the vegetation samples and to describe the database design. The data are presented in geospatial, spreadsheet, and tab-delimited file formats.

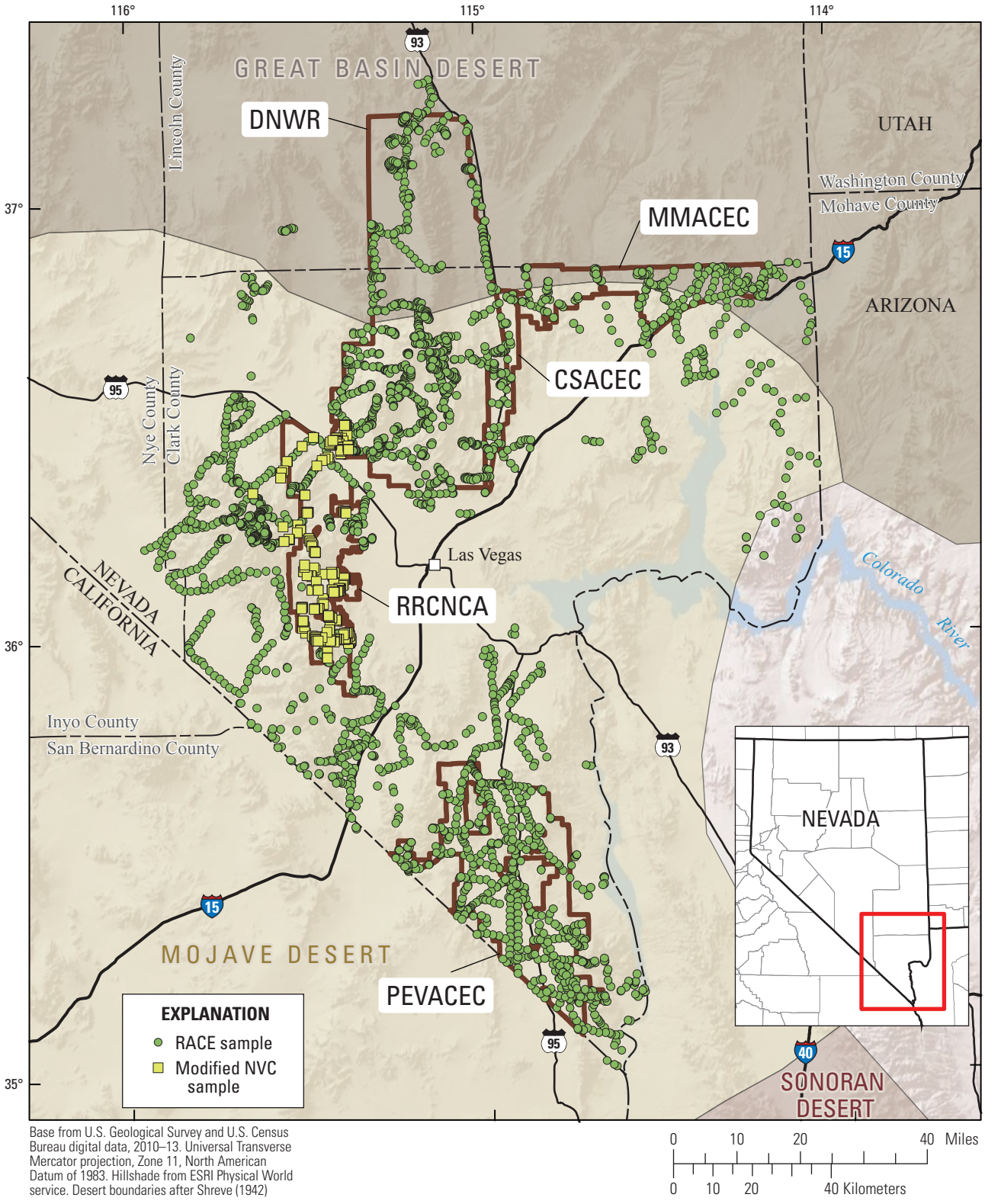

Figure 1. Sample sites and study areas in Clark and Lincoln Counties, Nevada. (CSACEC, Coyote Springs Area of Critical Environmental Concern; DNWR, Desert National Wildlife Refuge; MMACEC, Mormon Mesa Area of Critical Environmental Concern; PEVACEC, Piute-Eldorado Valley Area of Critical Environmental Concern; NVC, National Vegetation Classification; RACE, rapid assessment community ecology; RRCNCA, Red Rock Canyon National Conservation Area.)

Data Collection Methods

Samples were collected by two methods. In the RRCNCA, samples were collected by using a plot method modified from the NVC standards (Jennings and others, 2002). Seeking a more efficient, yet still robust, data collection method, the team developed a different method, which was named "rapid assessment community ecology" (RACE), for samples collected for the Ecosystem Indicators project (Heaton and others, 2011). This method was used for all samples, except those in the RRCNCA. An overview of the similarities and differences between the methods is shown in table 1 and discussed fully in the next sections.

Modified NVC Plot Sampling Approach

The standard modified NVC plot was a 20-meter (m) by 20-m square. The location for the southeast corner of the plot was selected by tossing a flagged stake over the shoulder within an homogenous plant community to be sampled. The southeast corner point was the location recorded in the database for the sample. From the southeast corner point, a 20-m tape was laid out due north to define the first plot border, followed by a second 20-m tape laid out due west. The northwest corner of the plot was temporarily marked with flagging so that the 20-m by 20-m plot could be easily visualized.

At times, a standard 20-m by 20-m plot would include more than one community because of the size, shape, and orientation of the target community. In these cases, either the orientation or length of the first tape, or both, was adjusted in order to capture the target community. The azimuth of the tape, relative to due north, was recorded. The second tape was laid out at a right angle to the first tape, and the length was adjusted to create a 400 square meter plot. Plot dimensions of 5 m by 80 m, 10 m by 40 m, and 16 m by 25 m were utilized. In this way, linear features, such as communities along stream channels, could be sampled regardless of orientation or width. In one case, a circular dune was sampled by using a circular plot with a diameter of 25 m. The dune was easily distinguishable from surroundings and flags were not used to define it.

Once the size and shape of the plot were determined, observers assessed the community by carefully traversing the entire area. Every species present or within 10 m of the plot borders was recorded, and its cover estimated.

RACE Sampling Approach

The standard RACE plot was circular and had a 200-m diameter. Instead of defining the plot with tapes, stakes, and flags, a global positioning system (GPS) receiver was used to establish the center point of the plot. This center point, also called the waypoint, was the location recorded in the database for the sample. From the waypoint, the observer determined if the community and the landform it occupied extended at least 100 m in all directions by using the GPS as a tether to the waypoint. As with the NVC modified plots, the size and shape of the RACE plot were adjusted to ensure data from an apparently homogenous community were recorded. In these cases, the GPS was used to adjust the tether distance, as necessary, and the dimensions of the plot were recorded.

Once the size of the plot was determined, the plant community was assessed by walking through it in a meandering fashion. Every effort was made to find all species by traversing an area until no new species could be found. All species encountered were recorded, and cover was estimated for the dominant species in each canopy layer.

Table 1. Summary comparison of modified National Vegetation Classification (NVC) plot and rapid assessment community ecology (RACE) sampling methods.

[**Abbreviations**: m, meter; m^2, square meter]

	Modified NVC plot	RACE
Number of samples	300	2,875
Standard size and shape	Square, 20 m by 20 m	Circular, 200-m diameter
Standard area	400 m^2	31,400 m^2
Shape and area can be adjusted	Yes	Yes
Assessment method	Observers traverse entire area and 10 m around	Observers meander within area until no additional species are encountered
Species data collected	Cover estimated for every species present	Cover estimated for dominant species only
Outcome of assessment	Stand name assigned	Stand name assigned

Sample Site Selection

Because the purpose of sampling was to document ground conditions, sample sites were selected while the field team travelled systematically through each study area by automobile, foot, and helicopter. Sample sites were selected with the intent of sampling all types of vegetation encountered. The modified NVC plot sampling in the RRCNCA was completed during a single growing season. The team worked by elevation, beginning at the lowest and working through the highest. The RACE data were collected across multiple growing seasons. The strategy was to travel by automobile on all navigable roads in a study area and sample a RACE plot every 1,690 m (1 mile) as measured on the odometer. Typically, the sample site was reached by leaving the automobile and walking, perpendicular to the road, more than 100 m. Additional RACE plots were defined at less than the 1,690 m increment if a change in the community was apparent from the vehicle or an area was so diverse that several communities could be assessed without additional driving. Once the road system for an area was exhausted, areas without roads were visited on foot, and some remote sample sites in the DNWR were accessed by helicopter.

Data Recorded

For both sampling methods, the sample was assigned a stand name in the field. The stand name indicates the dominant and co-dominant species within each canopy layer, if present: tree (emergent, canopy, subcanopy), shrub (tall shrub, short shrub, dwarf shrub), and herbaceous (forb and graminoid). Species were identified according to the taxonomy and nomenclature of the PLANTS database (U.S. Department of Agriculture, 2013). Simplified versions of the PLANTS symbols were used in the stand names. Each species was represented by a four-letter symbol made up of the first two letters of the genus followed by the first two letters of the species epithet. A fifth or sixth character (letter or number) was added to differentiate between species or to indicate a subspecies as necessary. The PLANTS symbols are required to be more complex to avoid redundancies in a nationwide database. Appendix 2 contains a key to correlate the simplified symbols to the official PLANTS symbols.

Species in the stand name are ordered according to canopy layer (highest to lowest, left to right) and then according to their relative percentage of cover within each canopy layer (most to least, left to right). Species in the same canopy layer are separated by a hyphen (-), and canopy layers are separated by a slash (/). If an azonal feature, such as a stream channel or desert pavement, is present, a one- or two-letter code (appendix 2) is added to the stand name following an underscore (_). For example, in a shrubland where *Larrea tridentata* dominates the tall shrub layer and *Ambrosia dumosa* shares dominance of the dwarf shrub layer with *Krameria erecta*, the stand name for the sample would be either LATR/AMDU-KRER or LATR/KRER-AMDU, depending on the relative coverages of *Ambrosia dumosa* and *Krameria erecta*. If the same dominants were found at a sample site on desert pavement, the stand name would be LATR/AMDU-KRER_DP or LATR/KRER-AMDU_DP. The stand name indicates relative height and cover of the dominant species, but not absolute values such as the height, percentage of cover, or which canopy layer is occupied by the individual species. Some absolute values are available in the "Comments" fields of the database.

In addition to stand name, wetland classification, slope, aspect, major landform, and surficial geology were recorded in the field and included in the database. The Cowardin System wetland classification was assessed first, and it often helped to determine the size and shape of the sample plot (Cowardin and others, 1979). Slope was described with qualitative terms ranging from "flat" to "steep." The aspect was determined with the GPS unit to the nearest 16th of a cardinal degree. The major landform and surficial geology were described qualitatively. Finally, the observers used two comment fields to record additional observations about the sample site or other miscellaneous conditions.

Data Classification

The NVC is a national physiognomic-floristic hierarchical framework for vegetation classification across many levels and scales. The original framework for NVC was conceptual; the hierarchical levels were defined but a list of recognized units within each level was not complete (Federal Geographic Data Committee, 1997). By design, the hierarchical levels and their recognized units have been under revision since initial publication (Jennings, 2002) and have remained so after the release of Version 2 in 2008 (Federal Geographic Data Committee, 2008; Jennings, 2009).

The finest levels of detail in the NVC are provided at the floristic levels, called associations and alliances. The list of recognized units at the floristic levels is incomplete for Nevada and particularly lacking for the Mojave Desert (Peterson, 2008). Much of the data collected for this study do not accurately fit into currently recognized floristic units, and the data collection and statistical analysis required to propose recognition of new units are beyond the scope of this study. Instead, like Peterson (2008), the samples were assigned names patterned after recognized units if a recognized unit was not available to accurately describe the sample. The levels of association and alliance cannot be distinguished without statistical analysis, so all floristic unit names in the database were categorized at the level of alliance, which is higher. Assigning alliance names allowed the data to be worked through the mid- and upper levels of the NVC hierarchy (table 2).

Table 2. National Vegetation Classification (NVC) hierarchy.

[Source: Federal Geographic Data Committee, 2008, National vegetation classification standard, version 2, FGDC-STD-005-2008: accessed December 6, 2012, *http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/NVCS_V2_FINAL_2008-02.pdf*.]

NVC hierarchy level	Criteria
	Upper: Physiognomy plays a predominant role.
Level 1–Class	Broad combinations of general dominant growth forms that are adapted to basic temperature (energy budget), moisture, and/or substrate or aquatic conditions.
Level 2–Subclass	Combinations of general dominant and diagnostic growth forms that reflect global macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate or aquatic conditions.
Level 3–Formation	Combinations of dominant and diagnostic growth forms that reflect global macroclimatic factors as modified by altitude, seasonality of precipitation, substrates, and hydrologic conditions.
	Middle: Both floristics and physiognomy play a significant role.
Level 4–Division	Combinations of dominant and diagnostic growth forms and a broad set of diagnostic plant taxa that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
Level 5–Macrogroup	Combinations of moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and subcontinental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
Level 6–Group	Combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
	Lower: Floristics plays a predominant role.
Level 7–Alliance	Diagnostic species, including some from the dominant growth form or layer, and moderately similar composition that reflect regional to subregional climate substrates, hydrology, moisture/nutrient factors, and disturbance regimes.
Level 8–Association	Diagnostic species, usually from multiple growth forms or layers, and more narrowly similar composition that reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes.

With one exception, all samples were classified into recognized units at the NVC group level. One group was created as a placeholder in order to account for Mojave saltbush shrublands. These communities appropriately classify into Macrogroup 090, North American Warm Desert Alkaline-Saline Semi-Desert Scrub, but the only recognized group within it is Group 299, Chihuahuan Lowland Basin Semi-Desert Scrub Group. It would be geographically inaccurate to classify the plant communities of the salt desert in the northern end of the Mojave Desert as a group representing the Chihuahuan Desert. Instead, these communities (181 of 3,175 samples) were placed in Group 999, Mojave Saltbush Shrubland Group [placeholder]. Other recognized groups considered for these communities were Group 300, Intermountain Shadscale-Saltbush Scrub Group, and Group 299, Chihuahuan Group. These groups were rejected because they would identify these communities as cool instead of warm desert communities up to the subclass level of the NVC.

Database Design

The vegetation sample sites, location information, field data and notes, and NVC hierarchy were compiled in an ESRI ArcGIS 10.1 geodatabase that can be used for visualization, mapping, or analysis within a geographic information system (GIS). The sample sites are represented by a point layer with attributes for the stand and alliance names and a code corresponding to an NVC hierarchy table. Each sample site has a unique identification code that corresponds to tables containing details such as plot shape and size, and other data and notes recorded in the field. Federal Geographic Data Committee compliant metadata describing the geodatabase is also included. See figure 2 for a schematic of the database organization and appendix 1 for a description of each database component and its attributes. Tabular versions of the vegetation database in Microsoft Excel® and tab-delimited text file formats are also available.

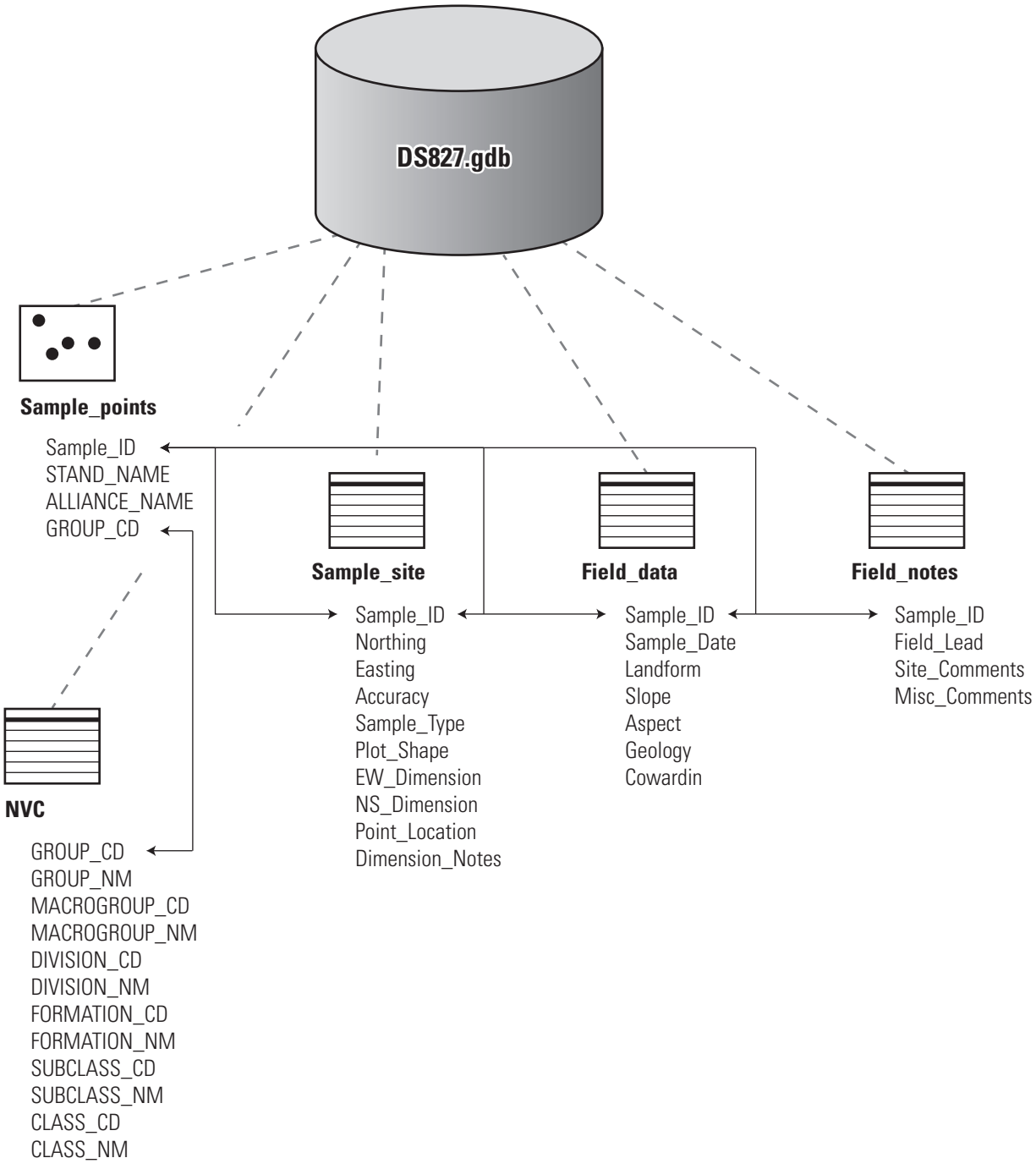

Figure 2. Schematic of the database design. (CD, code; E, east; ID, identification; Misc, miscellaneous; N, north; NM, name; NVC, National Vegetation Classification; S, south; and W, west.)

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Appendix 1. Geospatial Database Components and Attributes

Table 1-1. Geospatial database components and attributes.

[**Abbreviations**: CD, code; EW, east to west; GPS, Global Positioning System; ID, identification; m, meter; NM, name; NS, north to south; NVC, National Vegetation Classification; RACE, rapid assessment community ecology; ×, by]

Component and attributes	Description
Sample_points	A geodatabase feature class (a type of vector geospatial data set) representing sample locations with vegetation attributes. Also available as a tab-delimited table or a Microsoft Excel® spreadsheet.
Sample_ID	The unique identification number of a sample. This column can be used to relate the sample to the Sample_site, Field_data, and Field_notes tables.
STAND_NAME	A code that describes the vegetation community present at the site at the stand level. Each dominant species name is assigned a symbol (see appendix 2) and the species are grouped and listed according to canopy layer. See the "Data Recorded" section of the text for a complete explanation.
ALLIANCE_NAME	Classification of the sample into the alliance level of the National Vegetation Classification Standard (NVC; [1]Federal Geographic Data Committee, 2008) hierarchy. Samples that could not be classified into recognized alliances are assigned names patterned after recognized alliances or associations. For details, see the "Data Classification" section of the text.
GROUP_CD	A unique code that represents the NVC group into which the sample is classified. This code can be used to relate each sample to the NVC hierarchy using the NVC table. All group codes represent recognized NVC groups except G999, which is a placeholder group created for this database. For details, see the "Data Classification" section of the text.
Sample_site	A geodatabase table containing information about the location of the sample. Also available as a tab-delimited table or Microsoft Excel® spreadsheet.
Sample_ID	The unique identification number of a sample.
Northing	Northing coordinates for the sample in Universal Transverse Mercator, Zone 11 projection, North American Datum of 1983
Easting	Easting coordinates for the sample in Universal Transverse Mercator, Zone 11 projection, North American Datum of 1983
Accuracy	The collection method for coordinates for the sample location. GPS represents a recreational-grade global positioning system unit was used to capture coordinate information. These devices are generally considered to be accurate to within 10 meters.
Sample_Type	The sample type: modified NVC plot samples were collected in Red Rock Canyon National Conservation Area; RACE samples were collected for the rest of the study areas.
Plot_Shape	The approximate shape of the sample area. Modified NVC plot samples are assumed to be square and RACE samples are assumed to be round unless Dimension Notes indicate otherwise. See Dimension_Notes description for more details.
EW_Dimension	The approximate dimension of the sample area in meters, measured from east to west. Dimensions are assumed to be 20 meters for modified NVC plot samples and 200 meters for RACE samples unless the Dimension Notes indicate otherwise. See Dimension_Notes description for more details.
NS_Dimension	The approximate dimension of the sample area in meters, measured from north to south. Dimensions are assumed to be 20 meters for modified NVC plot samples and 200 meters for RACE samples unless the Dimension Notes indicate otherwise. See Dimension_Notes description for more details.
Point_Location	The position of the point location of the sample relative to the sample area. For modified NVC plot samples, the coordinates represents the southeast corner of the sampled area. For RACE samples, the coordinates represent the center of the sampled area.
Dimension_Notes	Transcribed narrative from field notebooks describing the size and shape of the sample. These notes were used to determine values for the EW_Dimension and NS_Dimension fields if available. Many entries provide dimensions without directions. For example, "100 m × 200 m." It was assumed the dimensions were listed in the order of east-west and then north-south. No additional verification was done.
Field_data	A geodatabase table containing data recorded in the field about the sample. Also available as a tab-delimited table or Microsoft Excel® spreadsheet.
Sample_ID	The unique identification number of a sample.
Sample_Date	The month (mm), day (dd), and year (yyyy) the sample was recorded, formatted as mm/dd/yyyy.
Landform	The major landform upon which the sample area is situated, as estimated in the field.

Table 1-1. Geospatial database components and attributes.—Continued

[**Abbreviations**: CD, code; EW, east to west; GPS, Global Positioning System; ID, identification; m, meter; NM, name; NS, north to south; NVC, National Vegetation Classification; RACE, rapid assessment community ecology; ×, by]

Component and attributes	Description
Slope	The slope at the sample area, as estimated in the field. Modified NVC plot samples are assigned numerical values between 0 and 90 degrees; RACE samples are described in qualitative terms such as flat, gentle, steep, etc.
Aspect	The aspect at the sample area, as estimated in the field to the nearest 1/16th of a cardinal direction. N, north; S, south; E, east, W, west. For example, ENE represent east northeast.
Geology	A qualitative description of the surficial geology at the sample site, as recorded in the field.
Cowardin	The Cowardin System wetland classification ([2]Cowardin and others, 1979) of the sample, as determined in the field.
Field_notes	A geodatabase table containing transcribed field notes about the sample. Also available as a tab-delimited table or Microsoft Excel® spreadsheet.
Sample_ID	The unique identification number of a sample.
Field_Lead	The name of the botanist leading the field team. Notes in the "Site_Comments" and "Misc_Comments" columns were recorded by this person.
Site_Comments	Comments recorded in the field by the field lead (see "Field_Lead" column) regarding site conditions. Comments were transcribed from field notebooks and have not been reviewed. They may contain misspellings, typos, codes and abbreviations, or references that are not documented or cited in this report.
Misc_Comments	Miscellaneous comments recorded in the field by the field lead (see "Field_Lead" column). Comments were transcribed from field notebooks and have not been reviewed. They may contain misspellings, typos, codes and abbreviations, or references that are not documented or cited in this report.
NVC	National Vegetation Classification Standard (NVC; Federal Geographic Data Committee, 2008) hierarchy at the group level and above. Samples in the Sample_site table can be related to this table by the GROUP_CD column. Also available as a tab-delimited table or Microsoft Excel® spreadsheet.
GROUP_CD	A unique code that represents a group in the NVC hierarchy. All group codes represent recognized NVC groups, except G999, which is a placeholder group created for this database. For details, see the "Data Classification" section in the text.
GROUP_NM	The name of a group in the NVC hierarchy. All group names represent recognized NVC groups, except Mojave Saltbush Shrubland Group, which is a placeholder group created for this study. For details, see the "Data Classification" section in the text.
MACROGROUP_CD	A unique code that represents a macrogroup in the NVC hierarchy.
MACROGROUP_NM	The name of a macrogroup in the NVC hierarchy.
DIVISION_CD	A unique code that represents a division in the NVC hierarchy.
DIVISION_NM	The name of a division in the NVC hierarchy.
FORMATION_CD	A unique code that represents a formation in the NVC hierarchy.
FORMATION_NM	The name of a formation in the NVC hierarchy.
SUBCLASS_CD	A unique code that represents a subclass in the NVC hierarchy.
SUBCLASS_NM	The name of a subclass in the NVC hierarchy.
CLASS_CD	A unique code that represents a class in the NVC hierarchy.
CLASS_NM	The name of a class in the NVC hierarchy.

[1]Federal Geographic Data Committee, 2008, National vegetation classification standard, version 2, FGDC-STD-005-2008, accessed December 6, 2012, at *http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/NVCS_V2_FINAL_2008-02.pdf*.

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Appendix 2. List of Symbols Used in Stand Names

Table 2-1. List of symbols used in stand names.

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name code for azonal feature	Azonal feature
DP	Desert pavement
D	Dune
GB	Granite bedrock
G_B	Gravel barrens
IF	Intermittently flooded
LS	Landslide mass-wasting slope
LB	Limestone bedrock
PN	Petrocaclic nodules
Playa	Playa
QB	Quartzite bedrock
SB	Sandstone bedrock
S	Saturated
SF	Seasonally flooded
PF	Semi-permanently flooded
SV	Sparsely vegetated
SM	Spring mound
TS	Talus slope
TF	Temporarily flooded
TB	Tuff bedrock
VB	Volcanic bedrock

Stand name symbol for vegetation species	USDA/NRCS Species name ([1]U.S. Department of Agriculture, 2013)	USDA/NRCS Species symbol ([1]U.S. Department of Agriculture, 2013)
ABCO	*Abies concolor concolor*	ABCOC
ACGR	*Acacia greggii*	ACGRG3
ACSH	*Acamptopappus shockleyi*	ACSH
ACSPS2	*Acamptopappus sphaerocephalus*	ACSPS2
ACGL	*Acer glabrum diffusum*	ACGLD3
ACHY	*Achnatherum hymenoides*	ACHY
ACLE	*Achnatherum lettermannii*	ACLE9
ACPA	*Achnatherum parishii parishii*	ACPAP
ACSP12	*Achnatherum speciosum*	ACSP12
ADCO	*Adenophyllum cooperi*	ADCO2
AGUT	*Agave utahensis eborispina*	AGUTE
AMDU	*Ambrosia dumosa*	AMDU2
AMER	*Ambrosia eriocentra*	AMER
AMUT	*Amelanchier utahensis (sensu lato)*	AMUT
AMFR	*Amphipappus fremontii fremontii*	AMFRF
AMTO	*Amsonia tomentosa*	AMTOT
ANCA	*Anemopsis californica*	ANCA10
ANSC	*Angelica scabrida*	ANSC9
ANRO	*Antennaria rosea*	ANROR
ANSO	*Antennaria soliceps*	ANSO2
AQFO	*Aquilegia formosa*	AQFO
ARPU5	*Arctostaphylos pungens*	ARPU5
ARMU	*Argemone munita*	ARMU
ARPUP6	*Aristida purpurea purpurea*	ARPUP6
ARBI	*Artemisia bigelovii*	ARBI3
ARDR	*Artemisia dracunculus*	ARDR4
ARMI	*Artemisia michauxiana*	ARMI4
ARNO	*Artemisia nova*	ARNO4
ARTR	*Artemisia tridentata*	ARTR2
ARTRT	*Artemisia tridentata tridentata*	ARTRT
ARTRW	*Artemisia tridentata wyomingensis*	ARTRW8
ARDO	*Arundo donax*	ARDO4
ATCA	*Atriplex canescens*	ATCAC

Table 2-1. List of symbols used in stand names.—Continued

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name symbol for vegetation species	USDA/NRCS Species name ([1]U.S. Department of Agriculture, 2013)	USDA/NRCS Species symbol ([1]U.S. Department of Agriculture, 2013)
ATCO	*Atriplex confertifolia*	ATCO
ATHY	*Atriplex hymenelytra*	ATHY
ATLE	*Atriplex lentiformis*	ATLEL
ATPO	*Atriplex polycarpa*	ATPO
BASA	*Baccharis salicifolia*	BASA4
BASE	*Baccharis sergiloides*	BASE
BAMU	*Baileya multiradiata*	BAMU
BEJU	*Bebbia juncea aspera*	BEJUA
BOGR	*Bouteloua gracilis*	BOGR2
BOTR	*Bouteloua trifida*	BOTRT
BRTO	*Brassica tournefortii*	BRTO
BRAT	*Brickellia atractyloides*	BRAT
BRCA	*Brickellia californica*	BRCAC
BRGR	*Brickellia grandiflora*	BRGR
BRIN	*Brickellia incana*	BRIN
BRLO	*Brickellia longifolia*	BRLO
BRMI	*Brickellia microphylla watsonii*	BRMIW
BROB	*Brickellia oblongifolia*	BROBO
BRCI	*Bromus ciliatus*	BRCIC3
BRMA	*Bromus rubens*	BRRU2
BRTE	*Bromus tectorum*	BRTE
BUUT	*Buddleja utahensis*	BUUT
CALA	*Calylophus lavandulifolius*	CALA38
CANE	*Carex nebrascensis*	CANE2
CAPR	*Carex praegracilis*	CAPR5
CARO	*Carex rossii*	CARO5
CEGR	*Ceanothus greggii (sensu lato)*	CEGR
CEMA	*Ceanothus martinii*	CEMA2
CERE	*Celtis laevigata reticulata*	CELAR
CEOC	*Cercis orbiculata*	CEOR9
CEIN	*Cercocarpus intricatus*	CEIN7
CELE	*Cercocarpus ledifolius intercedens*	CELEI
CHLI	*Chilopsis linearis arcuata*	CHLIA
CHGR	*Chrysothamnus gramineus*	CHGR13
CHVI	*Chrysothamnus viscidiflorus viscidiflorus (sensu lato)*	CHVIV2
CIAR	*Cirsium arizonicum*	CIAR3
CIEAC	*Cirsium clokeyi*	CICL2
CLLI	*Clematis ligusticifolia*	CLLIL2
CORA	*Coleogyne ramosissima*	CORA
COUM	*Comandra umbellata pallida*	COUMP
CUSA	*Cuscuta salina*	CUSAS
CYAC	*Cylindropuntia acanthocarpa*	CYACA2
CYBI	*Cylindropuntia bigelovii*	CYBI9
CYEC	*Cylindropuntia echinocarpa*	CYEC3
CYRA	*Cylindropuntia ramosissima*	CYRA9
CYWH	*Cylindropuntia whipplei*	CYWH
DASE	*Dalea searlsiae*	DASE3
DAPU	*Dasyochloa pulchella*	DAPU7
DISP	*Distichlis spicata*	DISP
DORE	*Dodecatheon redolens*	DORE
DRCU	*Draba cuneifolia*	DRCUC
ECPO	*Echinocactus polycephalus*	ECPOP
ECEN	*Echinocereus engelmannii (sensu lato)*	ECEN
ELAN	*Elaeagnus angustifolia*	ELAN
ELRO	*Eleocharis rostellata*	ELRO2

Table 2-1. List of symbols used in stand names.—Continued

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name symbols for vegetation species	USDA/NRCS Species name ([1]USDA, 2013)	USDA/NRCS Species symbol ([1]USDA, 2013)
ELEL	*Elymus elymoides (sensu lato)*	ELEL5
ELTR	*Elymus trachycaulus*	ELTRT
ENFA	*Encelia farinosa*	ENFA
ENVI	*Encelia virginensis*	ENVI
EPFA	*Ephedra fasciculata*	EPFA
EPNE	*Ephedra nevadensis*	EPNE
EPTO	*Ephedra torreyana*	EPTOT
EPVI	*Ephedra viridis*	EPVI
ERCO40	*Ericameria compacta*	ERCO40
ERCO23	*Ericameria cooperi*	ERCO23
ERDI	*Ericameria discoidea discoidea*	ERDID
ERLI	*Ericameria linearifolia*	ERLI6
ERNA7	*Ericameria nana*	ERNA7
ERNAH	*Ericameria nauseosa hololeuca*	ERNAH
ERNAL	*Ericameria nauseosa leiosperma*	ERNAL
ERNAM	*Ericameria nauseosa mojavensis*	ERNAM
ERNAS	*Ericameria nauseosa speciosa*	ERNAS2
ERPA	*Ericameria paniculata*	ERPA29
ERPAN	*Ericameria parryi nevadensis*	ERPAN2
ERCL	*Erigeron clokeyi clokeyi*	ERCL
ERAN	*Eriodictyon angustifolium*	ERAN2
ERFA	*Eriogonum fasciculatum polifolium*	ERFAP
ERHEA	*Eriogonum heermannii argense*	ERHEA
ERHEC	*Eriogonum heermannii clokeyi*	ERHEC
ERHES	*Eriogonum heermannii sulcatum*	ERHES2
ERIN	*Eriogonum inflatum*	ERINI4
ERPU	*Eriogonum pusillum*	ERPU6
ERTR	*Eriogonum trichopes*	ERTRT3
ERUMJ	*Eriogonum umbellatum juniporinum*	ERUMJ
ERWR	*Eriogonum wrightii membranaceum*	ERWRM
ERCI	*Erodium cicutarium*	ERCIC
EUUR	*Eucnide urens*	EUUR
FAPA	*Fallugia paradoxa*	FAPA
FEUT	*Fendlerella utahensis*	FEUTU
FECY	*Ferocactus cylindraceus (sensu lato)*	FECY
RHBE	*Frangula betulifolia obovata*	FRBEO
RHTO	*Frangula californica ursina*	FRCAU
FRAN	*Fraxinus anomala*	FRANA
FRVE	*Fraxinus velutina*	FRVE2
GAST	*Galium stellatum eremicum*	GASTE2
GAFL	*Garrya flavescens*	GAFL2
GACO	*Gaura coccinea*	GACO5
GLSP	*Glossopetalon spinescens aridum*	GLSPA
GRSP	*Grayia spinosa*	GRSP
GUMI	*Gutierrezia microcephala*	GUMI
GUSA	*Gutierrezia sarothrae*	GUSA2
HESH	*Hecastocleis shockleyi*	HESH
HEMU	*Heliomeris multiflora*	HEMUM
HECO	*Hesperostipa comata*	HECOC8
HERU	*Heuchera rubescens alpicola*	HERUA
HODU	*Holodiscus dumosus*	HODU
HYSA	*Hymenoclea salsola*	HYSAS
HYCO	*Hymenoxys cooperi*	HYCOC2
ISAC	*Isocoma acradenia eremophila*	ISACE2
IVJA	*Ivesia jaegeri*	IVJA

Table 2-1. List of symbols used in stand names.—Continued

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name symbols for vegetation species	USDA/NRCS Species name ([1]USDA, 2013)	USDA/NRCS Species symbol ([1]USDA, 2013)
JAAM	*Jamesia americana rosea*	JAAMR
JUBA	*Juncus balticus*	JUME4
JUCA	*Juniperus californica*	JUCA7
JUCO	*Juniperus communis depressa*	JUCOD
JUOS	*Juniperus osteosperma*	JUOS
JUSC	*Juniperus scopulorum*	JUSC2
KRER	*Krameria erecta*	KRER
KRGR	*Krameria grayi*	KRGR
KRLA	*Krascheninnikovia lanata*	KRLA2
LATR	*Larrea tridentata*	LATRT
LEFR	*Lepidium fremontii*	LEFRF
LELA	*Lepidium lasiocarpum*	LELAL
LINU	*Leptosiphon nuttallii pubescens*	LENUP
LILE	*Linum lewisii*	LILEL2
LUAR	*Lupinus argenteus*	LUARA11
LYAN	*Lycium andersonii*	LYANA4
LYCO	*Lycium cooperi*	LYCO2
LYSH	*Lycium shockleyi*	LYSH
MAFR	*Mahonia fremontii*	MAFR3
MAHA	*Mahonia haematocarpa*	MAHA4
MARE	*Mahonia repens*	MARE11
MAST	*Maianthemum stellatum*	MAST4
MEOF	*Melilotus officinalis*	MEOF
MESP	*Menodora spinescens*	MESP2
MELA	*Mentzelia laevicaulis*	MELAL3
MOUT	*Mortonia utahensis*	MOUT
MUAS	*Muhlenbergia asperifolia*	MUAS
MUPO	*Muhlenbergia porterii*	MUPO2
MUTH	*Muhlenbergia thurberi*	MUTH
NIAT	*Nicotiana attenuata*	NIAT
NOBI	*Nolina bigelovii*	NOBI
OECAC	*Oenothera caespitosa crinita*	OECAC3
OPBA	*Opuntia basilaris*	OPBAB2
OPPH	*Opuntia phaeacantha*	OPPH
OPPOE	*Opuntia polyacantha erinacea*	OPPOE
OPPOH	*Opuntia polyacantha hystricina*	OPPOH
PESEC	*Pedicularis semibarbata charlestonensis*	PESEC
PEPA8	*Penstemon palmeri*	PEPA8
PERA	*Peraphyllum ramosissimum*	PERA4
PEGR	*Perityle gracilis*	PEGR15
PEIN	*Perityle intricata*	PEIN12
PENI	*Petalonyx nitidus*	PENI
PEPA13	*Petalonyx parryi*	PEPA13
PEPU	*Petradoria pumila*	PEPUP
PECA	*Petrophytum caespitosum*	PECAC2
PESC	*Peucephyllum schottii*	PESC4
PHMI	*Philadelphus microphyllus*	PHMI4
PHCA	*Phoradendron californicum*	PHCA8
PHAU	*Phragmites australis*	PHAU7
PHAL	*Physocarpus alternans*	PHALA6
PIDE	*Picrothamnus desertorum*	PIDE4
PICA	*Pinus californianum*	PIMOC
PIFL	*Pinus flexilis*	PIFL2
PILO	*Pinus longaeva*	PILO

Table 2-1. List of symbols used in stand names.—Continued

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name symbols for vegetation species	USDA/NRCS Species name ([1]USDA, 2013)	USDA/NRCS Species symbol ([1]USDA, 2013)
PIMO	*Pinus monophylla*	PIMOM2
PIPO	*Pinus ponderosa scopulorum*	PIPOS
PIMI	*Piptatheropsis micranthum*	PIMI7
PLJA	*Pleuraphis jamesii*	PLJA
PLRI	*Pleuraphis rigida*	PLRI3
PLPL	*Pleurocoronis pluriseta*	PLPL
PLSE	*Pluchea sericea*	PLSE
POCO	*Poa compressa*	POCO
POFE	*Poa fendleriana*	POFEF
POPR	*Poa pratensis*	POPRP2
POSE	*Poa secunda*	POSE
POMA	*Polygala macradenia*	POMA7
POAN	*Populus angustifolia*	POAN3
POFR	*Populus fremontii*	POFRF3
POTR	*Populus tremuloides*	POTR5
POGR	*Porophyllum gracile*	POGR5
POCR	*Potentilla crinita*	POCRC2
PRGL	*Prosopis glandulosa torreyana*	PRGLT
PRPU	*Prosopis pubescens*	PRPU
PRFA	*Prunus fasciculata*	PRFAF
PSSP	*Pseudoroegneria spicata*	PSSPS
PSCO	*Psilostrophe cooperi*	PSCO2
PSFR	*Psorothamnus fremontii*	PSFRF
PSPO	*Psorothamnus polydenius*	PSPOP
PUGL	*Purshia glandulosa*	PUGL2
PUST	*Purshia stansburiana*	PUST
QUGA	*Quercus gambelii*	QUGAG
QUTU	*Quercus turbinella*	QUTU2
RHTR	*Rhus trilobata anisophylla*	RHTRA
RICE	*Ribes cereum*	RICEC2
RIMO	*Ribes montigenum*	RIMO2
ROWO	*Rosa woodsii ultramontana*	ROWOU
RULE	*Rubus leucodermis*	RULEL
SAME	*Salazaria mexicana*	SAME
SAEX	*Salix exigua*	SAEX
SAGO	*Salix gooddingii*	SAGO
SALA	*Salix lasiolepis*	SALA6
SAPA	*Salsola paulsenii*	SAPA8
SADOC	*Salvia dorrii clokeyi*	SADOC5
SADO	*Salvia dorrii dorrii*	SADOD3
SANIC5	*Sambucus nigra cerulea*	SANIC5
SAVE	*Sarcobatus vermiculatus*	SAVE4
SCAR	*Schismus arabicus*	SCAR
SCRI	*Scopulophila rixfordii*	SCRI2
SESP	*Senecio spartioides*	SESPS2
SEAR	*Senna armata*	SEAR8
SIRA	*Sisyrinchium radicatum*	SIRA3
SOSP	*Solidago spectabilis*	SOSPS6
SPAM	*Sphaeralcea ambigua (sensu lato)*	SPAM2
SPAN	*Sphaeralcea angustifolia*	SPAN3
SPGR	*Sphaeralcea grossulariifolia pedata*	SPGRP2
SPAI	*Sporobolus airoides*	SPAI
SPCR	*Sporobolus cryptandrus*	SPCR
STEL	*Stanleya elata*	STEL

Table 2-1. List of symbols used in stand names.—Continued

[**Abbreviations**: NRCS, Natural Resources Conservation Service; USDA, U.S. Department of Agriculture]

Stand name symbols for vegetation species	USDA/NRCS Species name ([1]USDA, 2013)	USDA/NRCS Species symbol ([1]USDA, 2013)
STPI	*Stanleya pinnata*	STPIP
STPA	*Stephanomeria parryi*	STPA3
SUMO	*Suaeda moquinii*	SUMO
SYLO	*Symphoriocarpos longiflorus*	SYLO
SYOR	*Symphoriocarpos oreophilus parishii*	SYROP
TARA	*Tamarix ramosissima*	TARA
TEAX	*Tetradymia axillaris (sensu lato)*	TEAX
TECA	*Tetradymia canescens*	TECA2
THMO	*Thamnosma montana*	THMO
TICA	*Tiquilia canescens*	TICAC
TRMU	*Tridens muticus*	TRMU
TYDO	*Typha domingensis*	TYDO
ULPU	*Ulmus pumila*	ULPU
VAAC	*Valeriana acutiloba pubicarpa*	VAACP
VIAR	*Vitis arizonica*	VIAR2
YUBA	*Yucca baccata*	YUBA
YUBR	*Yucca brevifolia*	YUBR
YUEL	*Yucca elata*	YUEL
YUSC	*Yucca schidigera*	YUSC2
ZIOB	*Ziziphus obtusifolia*	ZIOBC

[1]U.S. Department of Agriculture, 2013, USDA/NRCS PLANTS Database: National Plant Data Team, Greensboro, NC 27401-4901 USA, accessed April 18, 2013, at *http://plants.usda.gov*.

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Prepared by the Sacramento Publishing Service Center.

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Charlet and others—**Vegetation Database for Land-Cover Mapping, Clark and Lincoln Counties, Nevada**—DS 827

ISSN 2327-638X (online)

http://dx.doi.org/10.3133/ds827