

## Appendix D: Detailed Natural Resource Information

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### Introduction and Overview

This appendix contains tables and figures that provide additional detail to the Ecological Context and Important Resources and Stressors sections of [Chapter 1](#) of the Southern Colorado Plateau Network Monitoring Plan.

### Potential Terrestrial Ecosystems in SCPN Parks

The Information for the first three fields of the next three tables was taken directly from the NatureServe Explorer online database for ecological communities and systems <http://www.natureserve.org/explorer/>. Information regarding park ecosystems was obtained through Southwest ReGAP landcover maps, NPS vegetation mapping databases, and expert consultation.

**Table D1a. Montane Terrestrial Ecosystems potentially found in SCPN Parks.**

Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)	Large Patch	Canyon, Cliff, Ridgetop bedrock outcrop, Talus, Rock outcrops/ Barrens/ Glades, Oligotrophic soil, Very shallow soil, landslide	This ecological system of barren and sparsely vegetated landscapes (generally <10% plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry sparsely vegetated places on a landscape. The biota on them reflects what is surrounding them, unless it is an extreme parent material. There may be small patches of dense vegetation, but it typically includes scattered trees and/or shrubs. Characteristic trees includes species from the surrounding landscape, such as <i>Pseudotsuga menziesii</i> , <i>Pinus ponderosa</i> , <i>Pinus flexilis</i> , <i>Populus tremuloides</i> , <i>Abies concolor</i> , <i>Abies lasiocarpa</i> , or <i>Pinus edulis</i> and <i>Juniperus</i> spp. at lower elevations. There may be scattered shrubs present, such as species of <i>Holodiscus</i> , <i>Ribes</i> , <i>Physocarpus</i> , <i>Rosa</i> , <i>Juniperus</i> , and <i>Jamesia americana</i> , <i>Mahonia repens</i> , <i>Rhus trilobata</i> , or <i>Amelanchier alnifolia</i> . Soil development is limited, as is herbaceous cover.	BAND, CACH, SAPU, WACA
Rocky Mountain Aspen Forest and Woodland (CES306.813)	Large Patch	Forest & Woodland (Treed) Long disturbance interval, F-Patch/Medium Intensity, F-Landscape/Medium Intensity, Broad-Leaved Deciduous Tree, <i>Populus tremuloides</i>	This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs throughout much of the western U.S. and north into Canada, in the montane and subalpine zones. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by <i>Populus tremuloides</i> without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Associated shrub species include <i>Symphoricarpos</i> spp., <i>Rubus parviflorus</i> , <i>Amelanchier alnifolia</i> , and <i>Arctostaphylos uva-ursi</i> . Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests.	BAND, GRCA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPNS Parks
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)	Matrix	Montane, Forest & Woodland (Treed), Acidic Soil, Ustic, Very long disturbance interval, F-Patch/High Intensity Needle-leaved Tree <i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> RM Subalpine Mesic Spruce-Fir Long (>500 yrs) Persistence	Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, south into New Mexico and the Intermountain region. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with <i>Picea engelmannii</i> and <i>Abies lasiocarpa</i> dominating either mixed or alone. <i>Pseudotsuga menziesii</i> may persist in occurrences of this system for long periods without regeneration. <i>Pinus contorta</i> is common in many occurrences, and patches of pure <i>Pinus contorta</i> are not uncommon, as well as mixed conifer/ <i>Populus tremuloides</i> stands. In some areas, such as Wyoming, <i>Picea engelmannii</i> -dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Xeric species may include <i>Juniperus communis</i> , <i>Linnaea borealis</i> , <i>Mahonia repens</i> , or <i>Vaccinium scoparium</i> . More northern occurrences often have taller, more mesic shrub and herbaceous species, such as <i>Empetrum nigrum</i> , <i>Rhododendron albiflorum</i> , and <i>Vaccinium membranaceum</i> . Disturbance includes occasional blow-down, insect outbreaks and stand-replacing fire. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia.	BAND
Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)	Matrix	Montane, Forest and Woodland (Treed), Aridic, Intermediate Disturbance Interval, F-Patch/ Medium Intensity, F-Landscape/Medium Intensity, Needle-leaved Tree RM Montane Mesic Mixed Conifer, Moderate (100-500 yrs) persistence	This is a highly variable ecological system of the montane zone of the Rocky Mountains. It occurs throughout the southern Rockies, north and west into Utah, Nevada, western Wyoming and Idaho. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200 to 3300 m. Rainfall averages less than 75 cm per year (40-60 cm) with summer "monsoons" during the growing season contributing substantial moisture. The composition and structure of overstory is dependent upon the temperature and moisture relationships of the site, and the successional status of the occurrence. <i>Pseudotsuga menziesii</i> and <i>Abies concolor</i> are most frequent, but <i>Pinus ponderosa</i> may be present to codominant. <i>Pinus flexilis</i> is common in Nevada. <i>Pseudotsuga menziesii</i> forests occupy drier sites, and <i>Pinus ponderosa</i> is a common codominant. <i>Abies concolor</i> -dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and north- and east-facing slopes which burn somewhat infrequently. <i>Picea pungens</i> is most often found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifers can be found growing in the same occurrence, and there are a number of cold-deciduous shrub and graminoid species common, including <i>Arctostaphylos uva-ursi</i> , <i>Mahonia repens</i> , <i>Paxistima myrsinites</i> , <i>Symphoricarpos oreophilus</i> , <i>Jamesia americana</i> , <i>Quercus gambelii</i> , and <i>Festuca arizonica</i> . This system was undoubtedly characterized by a mixed severity fire regime in its "natural condition," characterized by a high degree of variability in lethality and return interval.	BAND, CACH, GRCA, MEVE, NAVA, SUCR, WACA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCP Parks
Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)	Large Patch	Forest & Woodland (Treed), Ravine, Stream terrace (undifferentiated), Toeslope, Mesotrophic soil, Ustic, Long disturbance interval, F-Patch/low intensity F-landscape/ low intensity Needle-leaved tree RM Montane Dry-Mesic Mixed Conifer	These are mixed conifer forests of the Rocky Mountains west into the ranges of the Great Basin, occurring predominantly in cool ravines and on north-facing slopes. Elevations range from 1200 to 3300 m. Occurrences of this system are found on cooler and more mesic sites than Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823). Such sites include lower and middle slopes of ravines, along stream terraces, moist, concave topographic positions and north- and east-facing slopes which burn somewhat infrequently. <i>Pseudotsuga menziesii</i> and <i>Abies concolor</i> are most common canopy dominants, but <i>Picea engelmannii</i> , <i>Picea pungens</i> , or <i>Pinus ponderosa</i> may be present. This system includes mixed conifer/ <i>Populus tremuloides</i> stands. A number of cold-deciduous shrub species can occur, including <i>Acer glabrum</i> , <i>Acer grandidentatum</i> , <i>Alnus incana</i> , <i>Betula occidentalis</i> , <i>Cornus sericea</i> , <i>Jamesia americana</i> , <i>Physocarpus malvaceus</i> , <i>Robinia neomexicana</i> , <i>Vaccinium membranaceum</i> , and <i>Vaccinium myrtillus</i> . Herbaceous species include <i>Bromus ciliatus</i> , <i>Carex geyeri</i> , <i>Carex rossii</i> , <i>Carex siccata</i> , <i>Muhlenbergia virescens</i> , <i>Pseudoroegneria spicata</i> , <i>Erigeron eximius</i> , <i>Fragaria virginiana</i> , <i>Luzula parviflora</i> , <i>Osmorhiza berteroi</i> , <i>Packera cardamine</i> , <i>Thalictrum occidentale</i> , and <i>Thalictrum fendleri</i> . Naturally occurring fires are of variable return intervals and mostly light, erratic, and infrequent due to the cool, moist conditions.	BAND, GRCA
Southern Rocky Mountain Ponderosa Pine Woodland (CES306.032)	Matrix	Ridge/Summit/ Upper Slope, Very Shallow Soil, Mineral: W/A-Horizon <10cm, Sand Soil Texture Aridic Intermediate disturbance interval, F-Patch/ medium intensity, Needle-leaved tree, <i>Pinus ponderosa</i> with shrubby understory	This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains, from the Greater Yellowstone region south. It is also found in the Colorado Plateau region, west into scattered locations in the Great Basin, and in the Black Hills of South Dakota and Wyoming. These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 1900 m in northern Wyoming to 2800 m in the New Mexico mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on igneous, metamorphic, and sedimentary material derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acid pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030) in the eastern Cascades, Okanogan and northern Rockies regions receives winter and spring rains, and thus has a greater spring "green-up" than the drier woodlands in the central Rockies. <i>Pinus ponderosa</i> (primarily var. <i>scopulorum</i> and var. <i>brachyptera</i> ) is the predominant conifer; <i>Pseudotsuga menziesii</i> , <i>Pinus edulis</i> , and <i>Juniperus</i> spp. may be present in the tree canopy. The understory is usually shrubby, with <i>Artemisia nova</i> , <i>Artemisia tridentata</i> , <i>Arctostaphylos patula</i> , <i>Arctostaphylos uva-ursi</i> , <i>Cercocarpus montanus</i> , <i>Purshia stansburiana</i> , <i>Purshia tridentata</i> , <i>Quercus gambelii</i> , <i>Symphoricarpos oreophilus</i> , <i>Prunus virginiana</i> , <i>Amelanchier alnifolia</i> , and <i>Rosa</i> spp. common species. <i>Pseudoroegneria spicata</i> and species of <i>Hesperostipa</i> , <i>Achnatherum</i> , <i>Festuca</i> , <i>Muhlenbergia</i> , and <i>Bouteloua</i> are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density.	BAND, CACH, ELMA, ELMO, GRCA, MEVE, SUCR, WACA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)	Matrix	Forest & Woodland (Treed), Needle-leaved tree Broad-leaved deciduous tree, Aspen-Conifer Mix	This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho and western Wyoming. Elevations range from 1700 to 2800 m. Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. The tree canopy is composed of a mix of deciduous and coniferous species, codominated by <i>Populus tremuloides</i> and conifers, including <i>Pseudotsuga menziesii</i> , <i>Abies concolor</i> , <i>Abies lasiocarpa</i> , <i>Picea engelmannii</i> , <i>Picea pungens</i> , <i>Pinus contorta</i> , <i>Pinus flexilis</i> , and <i>Pinus ponderosa</i> . As the occurrences age, <i>Populus tremuloides</i> is slowly reduced until the conifer species become dominant. Common shrubs include <i>Amelanchier alnifolia</i> , <i>Prunus virginiana</i> , <i>Acer grandidentatum</i> , <i>Symphoricarpos oreophilus</i> , <i>Juniperus communis</i> , <i>Paxistima myrsinites</i> , <i>Rosa woodsii</i> , <i>Spiraea betulifolia</i> , <i>Symphoricarpos albus</i> , or <i>Mahonia repens</i> . Herbaceous species include <i>Bromus carinatus</i> , <i>Calamagrostis rubescens</i> , <i>Carex geyeri</i> , <i>Elymus glaucus</i> , <i>Poa</i> spp., and <i>Achnatherum</i> , <i>Hesperostipa</i> , <i>Nassella</i> , and/or <i>Piptochaetium</i> spp. (= <i>Stipa</i> spp.), <i>Achillea millefolium</i> , <i>Arnica cordifolia</i> , Asteraceae spp., <i>Erigeron</i> spp., <i>Galium boreale</i> , <i>Geranium viscosissimum</i> , <i>Lathyrus</i> spp., <i>Lupinus argenteus</i> , <i>Mertensia arizonica</i> , <i>Mertensia lanceolata</i> , <i>Maianthemum stellatum</i> , <i>Osmorhiza berteroi</i> (= <i>Osmorhiza chilensis</i> ), and <i>Thalictrum fendleri</i> . Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system.	GRCA
Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)	Large Patch	Shrubland (Shrub-dominated), Shallow soil, Mineral: W/A-Horizon <10cm, Loam Soil Texture, Sand Soil Texture, Ustic, Unconsolidated, Intermediate disturbance interval, Broad-leaved deciduous shrub	This ecological system occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 m in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by <i>Quercus gambelii</i> alone or codominant with <i>Amelanchier alnifolia</i> , <i>Amelanchier utahensis</i> , <i>Artemisia tridentata</i> , <i>Cercocarpus montanus</i> , <i>Prunus virginiana</i> , <i>Purshia stansburiana</i> , <i>Purshia tridentata</i> , <i>Robinia neomexicana</i> , <i>Symphoricarpos oreophilus</i> , or <i>Symphoricarpos rotundifolius</i> . There may be inclusions of other mesic montane shrublands with <i>Quercus gambelii</i> absent or as a relatively minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of <i>Quercus gambelii</i> and <i>Amelanchier</i> spp. often increase after fire.	BAND, CACH, GRCA, MEVE, NAVA, WACA
Mogollon Chaparral (CES302.741)	Matrix	Montane, Lowland, Intermediate disturbance level, F-patch/ high intensity, Evergreen sclerophyllus shrub	This ecological system occurs across central Arizona (Mogollon Rim), western New Mexico and southern Utah and Nevada. It often dominates along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and <i>Pinus ponderosa</i> woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes species such as <i>Quercus turbinella</i> , <i>Quercus toumeyi</i> , <i>Cercocarpus montanus</i> , <i>Canotia holacantha</i> , <i>Ceanothus greggii</i> , <i>Forestiera pubescens</i> (= <i>Forestiera neomexicana</i> ), <i>Garrya wrightii</i> , <i>Juniperus deppeana</i> , <i>Purshia stansburiana</i> , <i>Rhus ovata</i> , <i>Rhus trilobata</i> , and <i>Arctostaphylos pungens</i> and <i>Arctostaphylos pringlei</i> at higher elevations. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.	GRCA, SAPU, WACA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)	Large Patch	Herbaceous, Acidic Soil, Mineral: W/A-Horizon >10cm, Loam soil texture, Silt soil texture, Aridic, Short disturbance interval, Graminoid, Cool-season bunch grasses	This Rocky Mountain ecological system typically occurs between 2200 and 3000 m on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acid, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: <i>Danthonia intermedia</i> , <i>Danthonia parryi</i> , <i>Festuca idahoensis</i> , <i>Festuca arizonica</i> , <i>Festuca thurberi</i> , <i>Muhlenbergia filiculmis</i> , or <i>Pseudoroegneria spicata</i> . The subdominants include <i>Muhlenbergia montana</i> , <i>Bouteloua gracilis</i> , and <i>Poa secunda</i> . These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole, ponderosa pine, and aspen forests. In limited circumstances (e.g. South Park in Colorado), they form the "matrix" of high-elevation plateaus.	BAND, GRCA, SUCR, WACA
Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)	Large Patch	Montane, Lowland, Shrubland (Shrub-dominated), Very shallow soil, Aridic, Intermediate disturbance level	This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico extending north into Wyoming, and west into the Intermountain region. These shrublands occur between 1500-2900 m elevations and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. It is common where <i>Quercus gambelii</i> is absent such as the northern Colorado Front Range and in drier foothills and prairie hills. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818), but may include mesic montane shrublands where <i>Quercus gambelii</i> does not occur. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including <i>Amelanchier utahensis</i> , <i>Cercocarpus montanus</i> , <i>Purshia tridentata</i> , <i>Rhus trilobata</i> , <i>Ribes cereum</i> , <i>Symphoricarpos oreophilus</i> , or <i>Yucca glauca</i> . In northeastern Wyoming and north into adjacent Montana, <i>Cercocarpus ledifolius</i> , usually with <i>Artemisia tridentata</i> , is the common dominant shrub. Grasses are represented as species of <i>Muhlenbergia</i> , <i>Bouteloua</i> , <i>Hesperostipa</i> , and <i>Pseudoroegneria spicata</i> . Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. <i>Cercocarpus montanus</i> requires a disturbance such as fire to reproduce, either by seed sprout or root crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth.	MEVE

**Table D1b. Dryland Terrestrial Ecosystems Potentially Found in SCPN Parks.**

Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765)	Matrix	Montane, Lowland, Shrubland (Shrub-dominated), Ridge/summit/ upper slope, Sedimentary rock, Temperate, Alkaline soil, Aridic	The distribution of this ecological system is centered on the Colorado Plateau where it is comprised of barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. Some eroding shale layers similar to Inter-Mountain Basins Shale Badland (CES304.789) may be interbedded between the harder rocks. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species includes <i>Pinus edulis</i> , <i>Pinus ponderosa</i> , <i>Juniperus</i> spp., <i>Cercocarpus intricatus</i> , and other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates.	CACH, GLCA, GRCA, NAVA, PEFO, RABR, WUPA
Inter-Mountain Basins Shale Badland (CES304.789)	Large Patch	Lowland, Badlands, Alkaline soil, Shale and mudstone, Silt soil texture, Clay soil texture	This widespread ecological system of the intermountain western U.S. is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from marine shales but also includes substrates derived from siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g. <i>Atriplex corrugata</i> , <i>Atriplex gardneri</i> , <i>Artemisia pedatifida</i> , and herbaceous vegetation.	CHCU, GLCA, PEFO, WUPA
Inter-Mountain Basins Active and Stabilized Dune (CES304.775)	Large Patch	Dune (landform), Dune field, Dune (substrate), Temperate, Sand soil texture, Aridic, W-landscape/ high intensity	This ecological system occurs in Intermountain West basins and is composed of unvegetated to moderately vegetated (<10-30% plant cover) active and stabilized dunes and sandsheets. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe, and occasionally woodlands. Vegetation varies and may be composed of <i>Achnatherum hymenoides</i> , <i>Artemisia filifolia</i> , <i>Artemisia tridentata</i> ssp. <i>tridentata</i> , <i>Atriplex canescens</i> , <i>Ephedra</i> spp., <i>Coleogyne ramosissima</i> , <i>Ericameria nauseosa</i> , <i>Leymus flavescens</i> , <i>Psoralidium lanceolatum</i> , <i>Purshia tridentata</i> , <i>Redfieldia flexuosa</i> , <i>Sporobolus airoides</i> , <i>Sarcobatus vermiculatus</i> , <i>Tetradymia tetrameres</i> , or <i>Tiquilia</i> spp.	CHCU, GLCA, MEVE, PEFO
Inter-Mountain Basins Volcanic Rock and Cinder Land (CES304.791)	Large Patch	Cinder cone, Lava flow (undifferentiated), Lava, Cinder, Basalt, Temperate	This ecological system occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates (generally <10% plant cover) such as basalt lava (malpais), basalt dikes with associated colluvium, basalt cliff faces and uplifted "backbones," tuff, cinder cones or cinder fields. It may occur as large-patch, small-patch and linear (dikes) spatial patterns. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g. elevation, age and type of substrate. At montane and foothill elevations scattered <i>Pinus ponderosa</i> , <i>Pinus flexilis</i> , or <i>Juniperus</i> spp. trees may be present. Shrubs such as <i>Ephedra</i> spp., <i>Atriplex canescens</i> , <i>Eriogonum corymbosum</i> , <i>Eriogonum ovalifolium</i> , and <i>Fallugia paradoxa</i> are often present on some lava flows and cinder fields. Species typical of sand dunes such as <i>Andropogon hallii</i> and <i>Artemisia filifolia</i> may be present on cinder substrates.	ELMA, PETR, SUCR, WUPA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)	Matrix	Forest & woodland (Treed), Very shallow soil, Shallow soil, Mineral: W/A-Horizon <10 cm, Aridic, Long disturbance interval, Needle-leaved tree, <i>Pinus edulis</i> , <i>Juniperus monosperma</i>	This southern Rocky Mountain ecological system occurs on dry mountains and foothills in southern Colorado east of the Continental Divide, in mountains and plateaus of north-central New Mexico, and extends out onto limestone breaks in the southeastern Great Plains. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. <i>Pinus edulis</i> and/or <i>Juniperus monosperma</i> dominate the tree canopy. <i>Juniperus scopulorum</i> may codominate or replace <i>Juniperus monosperma</i> at higher elevations. Stands with <i>Juniperus osteosperma</i> are representative of the Colorado Plateau and are not included in this system. In southern transitional areas between Madrean Pinyon-Juniper Woodland (CES305.797) and Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835) in central New Mexico, <i>Juniperus deppeana</i> becomes common. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species are more typical of southern Rocky Mountains than the Colorado Plateau and include <i>Artemisia bigelovii</i> , <i>Cercocarpus montanus</i> , <i>Quercus gambelii</i> , <i>Achnatherum scribneri</i> , <i>Bouteloua gracilis</i> , <i>Festuca arizonica</i> , or <i>Pleuraphis jamesii</i> .	BAND, CHCU, ELMA, ELMO, SAPU
Colorado Plateau Pinyon-Juniper Woodland	Matrix	Montane, Lowland, Mesa, Ridge/Summit/ Upper Slope, Sedimentary Rock, Temperate, Aridic, <i>Pinus edulis</i> , <i>Juniperus osteosperma</i>	This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and east into the northwestern corner of New Mexico. It is typically found at lower elevations ranging from 1500-2440 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. <i>Pinus edulis</i> and/or <i>Juniperus osteosperma</i> dominate the tree canopy. In the southern portion of the Colorado Plateau in northern Arizona and northwestern New Mexico, <i>Juniperus monosperma</i> and hybrids of <i>Juniperus</i> spp may dominate or codominate the tree canopy. <i>Juniperus scopulorum</i> may codominate or replace <i>Juniperus osteosperma</i> at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include <i>Arctostaphylos patula</i> , <i>Artemisia tridentata</i> , <i>Cercocarpus intricatus</i> , <i>Cercocarpus montanus</i> , <i>Coleogyne ramosissima</i> , <i>Purshia stansburiana</i> , <i>Purshia tridentata</i> , <i>Quercus gambelii</i> , <i>Bouteloua gracilis</i> , <i>Pleuraphis jamesii</i> , or <i>Poa fendleriana</i> . This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (CES304.773) and Colorado Plateau shrubland systems where sympatric.	CACH, HUTR, GRCA, MEVE, NAVA, PEFO, SUCR, WACA, YUHO

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCP Parks
Inter-Mountain Basins Mat Saltbush Shrubland (CES304.783)	Matrix	Lowland, Shrubland (shrub-dominated), Alluvial flat, Alluvial plain, Plain, Alkaline soil, Saline substrate chemistry, Calcareous, Silt soil texture, Clay soil texture, Dwarf-shrub, <i>Atriplex</i> spp.	This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos Shale and arid, wind-swept basins and plains across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. These landscapes typically support dwarf-shrublands composed of relatively pure stands of <i>Atriplex</i> spp. such as <i>Atriplex corrugata</i> or <i>Atriplex gardneri</i> . Other dominant or codominant dwarf-shrubs may include <i>Artemisia longifolia</i> , <i>Artemisia pedatifida</i> , or <i>Picrothamnus desertorum</i> , sometimes with a mix of other low shrubs such as <i>Krascheninnikovia lanata</i> or <i>Tetradymia spinosa</i> . <i>Atriplex confertifolia</i> or <i>Atriplex canescens</i> may be present, but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as <i>Xylorhiza glabriuscula</i> and <i>Sphaeralcea grossulariifolia</i> , and the perennial grasses <i>Achnatherum hymenoides</i> , <i>Bouteloua gracilis</i> , <i>Elymus elymoides</i> , <i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i> , <i>Pascopyrum smithii</i> , or <i>Sporobolus airoides</i> may dominate the herbaceous layer. In less saline areas, there may be inclusions of grasslands dominated by <i>Hesperostipa comata</i> , <i>Leymus salinus</i> , <i>Pascopyrum smithii</i> , or <i>Pseudoroegneria spicata</i> . In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as <i>Arenaria hookeri</i> and <i>Phlox hoodii</i> without dwarf-shrubs may be present. Annuals are seasonally present and may include <i>Eriogonum inflatum</i> , <i>Plantago tweedyi</i> , and the introduced annual grass <i>Bromus tectorum</i> .	GLCA
Colorado Plateau Pinyon-Juniper Shrubland (CES304.766)	Matrix	Lowland, Mesa, Ridge/Summit/ Upper slope, Sedimentary rock, Temperate, Aridic, <i>Pinus edulis</i> , <i>Juniperus osteosperma</i>	This ecological system is characteristic of the rocky mesatops and slopes on the Colorado Plateau and western slope of Colorado, but these stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands. Sites are drier than Colorado Plateau Pinyon-Juniper Woodland (CES304.767). Substrates are shallow/rocky and shaley soils at lower elevations (1200-2000 m). Sparse examples of the system grade into Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765). The vegetation is dominated by dwarfed (usually <3 m tall) <i>Pinus edulis</i> and/or <i>Juniperus osteosperma</i> trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include <i>Artemisia nova</i> , <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> , <i>Chrysothamnus viscidiflorus</i> , or <i>Coleogyne ramosissima</i> . Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.	GLCA, GRCA, MEVE
Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)	Matrix	Lowland, Shrubland (shrub-dominated), Toeslope/Valley bottom, Deep soil, Aridic, <i>Artemisia tridentata</i> ssp. <i>tridentata</i>	This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by <i>Artemisia tridentata</i> ssp. <i>tridentata</i> and/or <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> . Scattered <i>Juniperus</i> spp., <i>Sarcobatus vermiculatus</i> , and <i>Atriplex</i> spp. may be present in some stands. <i>Ericameria nauseosa</i> , <i>Chrysothamnus viscidiflorus</i> , <i>Purshia tridentata</i> , or <i>Symphoricarpos oreophilus</i> may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species include <i>Achnatherum hymenoides</i> , <i>Bouteloua gracilis</i> , <i>Elymus lanceolatus</i> , <i>Festuca idahoensis</i> , <i>Hesperostipa comata</i> , <i>Leymus cinereus</i> , <i>Pleuraphis jamesii</i> , <i>Pascopyrum smithii</i> , <i>Poa secunda</i> , or <i>Pseudoroegneria spicata</i> .	AZRU, CHCU, GLCA, GRCA, MEVE, YUHO

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCP Parks
Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)	Large Patch	Montane, Lowland, Shrubland (Shrub-dominated), Ridge/ Summit/ Upper slope, Temperate, Aridic	This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by <i>Artemisia nova</i> or <i>Artemisia bigelovii</i> sometimes with <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> codominant. Semi-arid grasses such as <i>Achnatherum hymenoides</i> , <i>Aristida purpurea</i> , <i>Bouteloua gracilis</i> , <i>Hesperostipa comata</i> , <i>Pleuraphis jamesii</i> , or <i>Poa fendleriana</i> are often present and may form a graminoid layer with over 25% cover.	GLCA, GRCA, MEVE, PEFO
Colorado Plateau Blackbrush-Mormon-tea Shrubland (CES304.763)	Large Patch	Lowland, Shrubland, Temperate, Aridic	This ecological system occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1650 m. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone or limestone bedrock, caliche or limestone alluvium. It also occurs in deeper soils on sandy plains where it may have invaded desert grasslands. The vegetation is characterized by extensive open shrublands dominated by <i>Coleogyne ramosissima</i> often with <i>Ephedra viridis</i> , <i>Ephedra torreyana</i> , or <i>Grayia spinosa</i> . Sandy portions may include <i>Artemisia filifolia</i> as codominant. The herbaceous layer is sparse and composed of graminoids such as <i>Achnatherum hymenoides</i> , <i>Pleuraphis jamesii</i> , or <i>Sporobolus cryptandrus</i> .	GLCA, GRCA, NAVA, RABR
Mojave Mid-elevation Mixed Desert Scrub (CES302.742)	Large Patch	Lowland, Shrubland, Evergreen sclerophyllus tree	This ecological system represents the extensive desert scrub in the transition zone above <i>Larrea tridentata</i> - <i>Ambrosia dumosa</i> desert scrub and below the lower montane woodlands (700-1800 m elevations) that occurs in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this ecological system is quite variable. Codominants and diagnostic species include <i>Coleogyne ramosissima</i> , <i>Eriogonum fasciculatum</i> , <i>Ephedra nevadensis</i> , <i>Grayia spinosa</i> , <i>Menodora spinescens</i> , <i>Nolina</i> spp., <i>Opuntia acanthocarpa</i> , <i>Salazaria mexicana</i> , <i>Viguiera parishii</i> , <i>Yucca brevifolia</i> , or <i>Yucca schidigera</i> . Desert grasses, including <i>Achnatherum hymenoides</i> , <i>Achnatherum speciosum</i> , <i>Muhlenbergia porteri</i> , <i>Pleuraphis jamesii</i> , <i>Pleuraphis rigida</i> , or <i>Poa secunda</i> , may form an herbaceous layer. Scattered <i>Juniperus osteosperma</i> or desert scrub species may also be present.	GRCA
Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)	Large Patch	Lowland, Shrubland (Shrub-dominated), Alluvial flat, Alluvial plain, Plain, Alkaline soil, Saline substrate chemistry, Calcareous, Silt soil texture, Clay soil texture, Xeromorphic shrub, Dwarf-shrub, <i>Atriplex</i> spp.	This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more <i>Atriplex</i> species such as <i>Atriplex confertifolia</i> , <i>Atriplex canescens</i> , <i>Atriplex polycarpa</i> , or <i>Atriplex spinifera</i> . Other shrubs present to codominant may include <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> , <i>Chrysothamnus viscidiflorus</i> , <i>Ericameria nauseosa</i> , <i>Ephedra nevadensis</i> , <i>Grayia spinosa</i> , <i>Krascheninnikovia lanata</i> , <i>Lycium</i> spp., <i>Picrothamnus desertorum</i> , or <i>Tetradymia</i> spp. <i>Sarcobatus vermiculatus</i> is generally absent, but if present does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as <i>Achnatherum hymenoides</i> , <i>Bouteloua gracilis</i> , <i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i> , <i>Pascopyrum smithii</i> , <i>Pleuraphis jamesii</i> , <i>Pleuraphis rigida</i> , <i>Poa secunda</i> , or <i>Sporobolus airoides</i> . Various forbs are also present.	AZRU, CACH, CHCU, ELMA, ELMO, GLCA, GRCA, PETR, PEFO, WUPA

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPNS Parks
Southern Rocky Mountain Juniper Woodland and Savanna (CES306.834)	Large Patch	Lowland, Woody-Herbaceous, Shallow soil, Mineral: W/A-Horizon <10 cm, Aridic, Needle-leaved tree, Graminoid, <i>Juniperus monosperma</i> and grasses	This ecological system occupies the lower and warmer elevations, growing from 1370 to 1830 m in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. It is best represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands. This system is best described as a savanna that has widely spaced, mature (>150 years old) juniper trees and occasionally <i>Pinus edulis</i> . <i>Juniperus monosperma</i> and <i>Juniperus scopulorum</i> (at higher elevations) are the dominant tall shrubs or short trees. These savannas may have inclusions of more dense juniper woodlands and have expanded into adjacent grasslands during the last century. Graminoid species are similar to those found in Western Great Plains Shortgrass Prairie (CES303.672), with <i>Bouteloua gracilis</i> and <i>Pleuraphis jamesii</i> being most common. In addition, succulents such as species of <i>Yucca</i> and <i>Opuntia</i> are typically present.	BAND, PETR, SAPU
Inter-Mountain Basins Juniper Savanna (CES304.782)	Large Patch	Temperate, Intermediate disturbance interval, F-Landscape/Medium Intensity, Evergreen Sclerophyllous tree, Graminoid	This widespread ecological system occupies dry foothills and sandsheets of western Colorado, northwestern New Mexico, northern Arizona, Utah, west into the Great Basin of Nevada and southern Idaho. It is typically found at lower elevations ranging from 1500-2300 m. This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (CES304.773) or Colorado Plateau Pinyon-Juniper Woodland (CES304.767). These occurrences are found on lower mountain slopes, hills, plateaus, basins and flats often where juniper is expanding into semi-desert grasslands and steppe. The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by <i>Juniperus osteosperma</i> trees with high cover of perennial bunch grasses and forbs, with <i>Bouteloua gracilis</i> , <i>Hesperostipa comata</i> , and <i>Pleuraphis jamesii</i> being most common. In the southern Colorado Plateau, <i>Juniperus monosperma</i> or juniper hybrids may dominate the tree layer. Pinyon trees are typically not present because sites are outside the ecological or geographic range of <i>Pinus edulis</i> and <i>Pinus monophylla</i> .	GLCA, PEFO
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Large Patch	Lowland, Woody Herbaceous, Temperate, Alkaline soil, Aridic, Very short disturbance interval, G-landscape/ high intensity, Graminoid	This ecological system occurs throughout the intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open shrub layer. Characteristic grasses include <i>Achnatherum hymenoides</i> , <i>Bouteloua gracilis</i> , <i>Distichlis spicata</i> , <i>Hesperostipa comata</i> , <i>Pleuraphis jamesii</i> , <i>Poa secunda</i> , and <i>Sporobolus airoides</i> . The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include <i>Atriplex canescens</i> , <i>Artemisia tridentata</i> , <i>Chrysothamnus greenei</i> , <i>Chrysothamnus viscidiflorus</i> , <i>Ephedra</i> spp., <i>Ericameria nauseosa</i> , <i>Gutierrezia sarothrae</i> , and <i>Krascheninnikovia lanata</i> . <i>Artemisia tridentata</i> may be present but does not dominate. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.	AZRU, BAND, CACH, CHCU, ELMO, GLCA, GRCA, HUTR, MEVE, PEFO, PETR, SAPU, WUPA, YUHO

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Western Great Plains Foothill and Piedmont Grassland (CES303.817)	Large Patch	Lowland, Toeslope/Valley bottom, Clay soil texture, Aridic, Short distance interval, F-Patch/Low intensity, Graminoid	This system typically occurs between 1600-2200 m in elevation. It is best characterized as a mixed-grass to tallgrass prairie on mostly moderate to gentle slopes, usually at the base of foothill slopes, e.g. the hogbacks of the Rocky Mountain Front Range where it typically occurs as a relatively narrow elevational band between montane woodlands and shrublands and the shortgrass steppe, but extends east on the Front Range piedmont alongside the Chalk Bluffs along the Colorado-Wyoming border, out into the Great Plains on the Palmer Divide, and on piedmont slopes below mesas and foothills in northeastern New Mexico. A combination of increased precipitation from orographic rain, temperature, and soils limits this system to the lower elevation zone with approximately 40 cm of precipitation/year. It is maintained by frequent fire and associated with well-drained clay soils. Usually occurrences of this system have multiple plant associations that may be dominated by <i>Andropogon gerardii</i> , <i>Schizachyrium scoparium</i> , <i>Muhlenbergia montana</i> , <i>Nassella viridula</i> , <i>Pascopyrum smithii</i> , <i>Sporobolus cryptandrus</i> , <i>Bouteloua gracilis</i> , <i>Hesperostipa comata</i> , or <i>Hesperostipa neomexicana</i> . In Wyoming, typical grasses found in this system include <i>Pseudoroegneria spicata</i> , <i>Festuca idahoensis</i> , <i>Hesperostipa comata</i> , and species of <i>Poa</i> . Typical adjacent ecological systems include foothill shrublands, ponderosa pine savannas, juniper savannas, as well as shortgrass prairie.	SAPU
Inter-Mountain Basins Semi-Desert Grassland	Large Patch	Lowland, Herbaceous, Temperate, Alkaline soil, Aridic, Graminoid	This widespread ecological system occurs throughout the intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or codominated by <i>Achnatherum hymenoides</i> , <i>Aristida</i> spp., <i>Bouteloua gracilis</i> , <i>Hesperostipa comata</i> , <i>Muhlenbergia</i> spp., or <i>Pleuraphis jamesii</i> and may include scattered shrubs and dwarf-shrubs of species of <i>Artemisia</i> , <i>Atriplex</i> , <i>Coleogyne</i> , <i>Ephedra</i> , <i>Gutierrezia</i> , or <i>Krascheninnikovia lanata</i> .	BAND, CHCU, ELMA, ELMO, GLCA, PEFO, PETR, SUCR, WACA, WUPA, YUHO
Inter-Mountain Basins Greasewood Flat (CES304.780)	Large Patch	Lowland, Shrubland (Shrub-dominated), Toeslope/Valley Bottom, Alkaline soil, Deep soil, Xeromorphic shrub	This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by <i>Sarcobatus vermiculatus</i> , <i>Atriplex canescens</i> , <i>Atriplex confertifolia</i> , or <i>Krascheninnikovia lanata</i> may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of <i>Sporobolus airoides</i> , <i>Distichlis spicata</i> (where water remains ponded the longest), or <i>Eleocharis palustris</i> herbaceous types.	CHCU, GLCA, GRCA, MEVE, WUPA, YUHO

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Southern Colorado Plateau Sand Shrubland (CES304.793)	Large Patch	Lowland, Woody-herbaceous, Temperate, Alkaline soil, Aridic, Very short disturbance interval, G-landscape/high intensity	<p>This large-patch ecological system is found on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah. It occurs on windswept mesas, broad basins and plains at low to moderate elevations (1300-1800 m). Substrates are stabilized sandsheets or shallow to moderately deep sandy soils that may form small hummocks or small coppice dunes. This semi-arid, open shrubland is typically dominated by short shrubs (10-30 % cover) with a sparse graminoid layer. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include <i>Ephedra cutleri</i>, <i>Ephedra torreyana</i>, <i>Ephedra viridis</i>, and <i>Artemisia filifolia</i>. <i>Coleogyne ramosissima</i> is typically not present. <i>Poliomintha incana</i>, <i>Parryella filifolia</i>, <i>Quercus havardii</i> var. <i>tuckeri</i>, or <i>Ericameria nauseosa</i> may be present to dominant locally. <i>Ephedra cutleri</i> and <i>Ephedra viridis</i> often assume a distinctive matty growth form. Characteristic grasses include <i>Achnatherum hymenoides</i>, <i>Bouteloua gracilis</i>, <i>Hesperostipa comata</i>, and <i>Pleuraphis jamesii</i>. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this system from Inter-Mountain Basins Active and Stabilized Dune (CES304.775).</p> <p><b>Land Cover Class:</b> Shrubland</p>	GLCA, GRCA, PEFO, PETR
Chihuahuan Gypsophilous Grassland and Steppe (CES302.732)	Large Patch	Herbaceous, Tropical/Subtropical, Temperate, Alkaline Soil, Gypsiferous, Dwarf-shrub, Graminoid	<p>This ecological system is restricted to gypsum outcrops or sandy gypsiferous and/or often alkaline soils that occur in basins and slopes in the Chihuahuan Desert. Elevation range is from 1100-2000 m. These typically sparse grasslands, steppes or dwarf-shrublands are dominated by a variety of gypsophilous plants, many of which are endemic to these habitats. Characteristic species include <i>Tiquilia hispidissima</i>, <i>Atriplex canescens</i>, <i>Calylophus hartwegii</i>, <i>Ephedra torreyana</i>, <i>Frankenia jamesii</i>, <i>Bouteloua breviseta</i>, <i>Mentzelia perennis</i>, <i>Nama carnosum</i>, <i>Calylophus hartwegii</i> (= <i>Oenothera hartwegii</i>), <i>Selinocarpus lanceolatus</i>, <i>Sporobolus nealleyi</i>, <i>Sporobolus airoides</i>, and <i>Sartwellia flaveriae</i>. This system does not include the sparsely vegetated gypsum dunes that are included in North American Warm Desert Active and Stabilized Dune (CES302.744).</p>	WUPA

**Table D1c. Wetland Terrestrial Ecosystems Potentially Found in SCPN Parks**

Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPN Parks
Inter-Mountain Basins Wash (CES304.781)	Linear	Lowland, Shrubland, Wash, Toeslope/Valley Bottom, Riverine/Alluvial, Alkaline Soil, Xeromorphic shrub, <i>Sarcobatus vermiculatus</i>	This barren and sparsely vegetated (generally <10% plant cover) ecological system is restricted to intermittently flooded streambeds and banks that are often lined with shrubs such as <i>Sarcobatus vermiculatus</i> , <i>Ericameria nauseosa</i> , <i>Fallugia paradoxa</i> , and/or <i>Artemisia cana ssp. cana</i> (in more northern and mesic stands). <i>Grayia spinosa</i> may dominate in the Great Basin. Shrubs form a continuous or intermittent linear canopy in and along drainages but do not extend out into flats. Typically it includes patches of saltgrass meadow where water remains for the longest periods. Soils are generally less alkaline than those found in the playa system. Desert scrub species (e.g. <i>Acacia greggii</i> , <i>Prosopis</i> spp.), that are common in the Mojave, Sonoran and Chihuahuan desert washes, are not present. This type can occur in limited portions of the southwestern Great Plains.	CACH, CHCU, WUPA
Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.821)	Linear	Montane, Riverine/Alluvial, Mineral: W/A-Horizon < 10 cm, Unconsolidated, Short (<5 yrs) flooding interval, Short (50-100 yrs) persistence	This system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include <i>Acer negundo</i> , <i>Populus angustifolia</i> , <i>Populus balsamifera</i> , <i>Populus deltoides</i> , <i>Populus fremontii</i> , <i>Pseudotsuga menziesii</i> , <i>Picea pungens</i> , <i>Salix amygdaloides</i> , or <i>Juniperus scopulorum</i> . Dominant shrubs include <i>Acer glabrum</i> , <i>Alnus incana</i> , <i>Betula occidentalis</i> , <i>Cornus sericea</i> , <i>Crataegus rivularis</i> , <i>Forestiera pubescens</i> , <i>Prunus virginiana</i> , <i>Rhus trilobata</i> , <i>Salix monticola</i> , <i>Salix drummondiana</i> , <i>Salix exigua</i> , <i>Salix irrorata</i> , <i>Salix lucida</i> , <i>Shepherdia argentea</i> , or <i>Symphoricarpos</i> spp. Exotic trees of <i>Elaeagnus angustifolia</i> and <i>Tamarix</i> spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.	AZRU, BAND, CACH, CHCU, GLCA, GRCA, HUTR, MEVE, NAVA, PEFO, SAPU, WUPA, YUHO
Inter-Mountain Basins Greasewood Flat (CES304.780)	Large Patch	Lowland, Shrubland (Shrub-dominated), Toeslope/Valley Bottom, Alkaline soil, Deep soil, Xeromorphic shrub	This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by <i>Sarcobatus vermiculatus</i> . <i>Atriplex canescens</i> , <i>Atriplex confertifolia</i> , or <i>Krascheninnikovia lanata</i> may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of <i>Sporobolus airoides</i> , <i>Distichlis spicata</i> (where water remains ponded the longest), or <i>Eleocharis palustris</i> herbaceous types.	CHCU, GLCA, GRCA, MEVE, PEFO, YUHO

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Ecological System (System code)	Spatial Pattern	Primary Diagnostic Classifier	Summary	SCPn Parks
North American Arid West Emergent Marsh (CES300.729)	Small Patch	Herbaceous, Depressional, Mineral W/A-Horizon > 10 cm, Aquatic herb, Graminoid, Deep (>15 cm) water, Saturated soil	This widespread ecological system occurs throughout much of the arid and semi-arid regions of western North America, typically surrounded by savanna, shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 m. Water levels may be stable, or may fluctuate 1 m or more over the course of the growing season. Water chemistry may include some alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Marshes have distinctive soils that are typically mineral, but can also accumulate organic material. Soils have characteristics that result from long periods of anaerobic conditions in the soils (e.g. gleyed soils, high organic content, redoximorphic features). The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions. Common emergent and floating vegetation includes species of <i>Scirpus</i> and/or <i>Schoenoplectus</i> , <i>Typha</i> , <i>Juncus</i> , <i>Potamogeton</i> , <i>Polygonum</i> , <i>Nuphar</i> , and <i>Phalaris</i> . This system may also include areas of relatively deep water with floating-leaved plants ( <i>Lemna</i> , <i>Potamogeton</i> , and <i>Brasenia</i> ) and submergent and floating plants ( <i>Myriophyllum</i> , <i>Ceratophyllum</i> , and <i>Elodea</i> ).	CACH, ELMA, ELMO, GLCA, GRCA, MEVE
Colorado Plateau Hanging Garden (CES304.764)	Small Patch	Montane, Cliff (landform), Cliff (Substrate), Sedimentary rock, Temperate, Seepage-fed sloping, Forb, Fern, Graminoid, Saturated soil	Hanging gardens in the Colorado Plateau region are surrounded by an arid environment and associated with canyon country. These highly localized environments include canyonlands with perennial water sources (seeps) forming pocketed wetlands and draping vegetation across wet cliff faces. Three main garden types exist: alcove, terrace, or windowblind. Each is determined by the nature of the geological formation and the presence or absence of joint systems. They tend to occur at all exposures of the canyon walls, but they are always shaded for much to most of each day. Temperature and humidity are relatively stable compared to the surrounding environment. Most hanging gardens are dominated by herbaceous plants, and a number of these are endemic to this region. Common species include <i>Adiantum capillus-veneris</i> , <i>Adiantum pedatum</i> , <i>Mimulus eastwoodiae</i> , <i>Mimulus guttatus</i> , <i>Sullivantia hapemanii</i> , <i>Cirsium rydbergii</i> , and several species of <i>Aquilegia</i> .	CACH, GLCA, GRCA
Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)	Small Patch	Dune (landform), Dune field, Dune (substrate), Temperate, Sand soil texture, W-landscape/high intensity, Graminoid	This ecological system occurs within dune fields in the intermountain western U.S. as small (usually less than 0.1 ha) interdunal wetlands that occur in wind deflation areas, where sands are scoured down to the water table. Small ponds may be associated. Water table may be perched over an impermeable layer of caliche or clay layer or, in the case of the Great Sand Dunes of Colorado, a geologic dike that creates a closed basin that traps water. These wetland areas are typically dominated by common emergent herbaceous vegetation such as species of <i>Eleocharis</i> , <i>Juncus</i> , and <i>Schoenoplectus</i> . Dune field ecological processes distinguish these emergent wetlands from similar non-dune wetlands.	GLCA?

### Elevation Information for SCPN Parks

Table D2. Elevation for the park units within the SCPN.

Park	Elevation (m)		Range (m)	Hectares by elevation zone (m) (values in parentheses indicate percent of total area)												Total (ha)
	Code	Min		Max	250-500	500-750	750-1000	1000-1250	1250-1500	1500-1750	1750-2000	2000-2250	2250-2500	2500-2750	2750-3000	
AZRU	1,705	1,764	59						101 (81.5)	23 (18.5)						124
BAND	1,626	3,081	1,455						728 (5.5)	5,658 (42.5)	4,051 (30.5)	1,297 (9.7)	1,005 (7.6)	525 (3.9)	38 (0.3)	13,303
CACH	1,687	2,336	650						1,417 (3.9)	11,039 (29.4)	24,344 (64.9)	686 (1.8)				37,486
CHCU	1,832	2,096	265							12,375 (89.1)	1,518 (10.9)					13,893
ELMA	1,950	2,554	604							422 (0.9)	34,465 (73.0)	12,312 (26.1)	18 (<0.1)			47,217
ELMO	2,183	2,304	121								399 (95.5)	19 (4.5)				418
GLCA	930	2,319	1,389			1,158 (0.2)	173,293 (34.2)	184,809 (36.5)	106,840 (21.1)	33,510 (6.6)	5,677 (1.1)	1,172 (0.2)				506,459
GRCA	348	2,798	2,450	6,563 (1.3)	21,071 (4.3)	40,808 (8.3)	90,075 (18.4)	128,302 (26.2)	63,801 (13.0)	62,369 (12.7)	31,530 (6.4)	20,298 (4.1)	23,616 (4.8)	1,098 (0.2)		489,529
HUTR	1,920	1,946	26							65 (100)						65
MEVE	1,833	2,613	779							1,188 (5.5)	9,253 (43.0)	10,562 (49.1)	501 (2.3)			21,504
NAVA	1,658	2,294	636						10 (4.1)	11 (4.5)	209 (85.7)	14 (5.7)				244
PEFO	1,618	1,891	273						34,754 (90.4)	3,685 (9.6)						38,439
PETR	1,519	1,838	319						2,318 (79.4)	599 (20.6)						2,918
RABR	1,129	1,492	363				39 (58.2)	28 (41.8)								67
SAPU	1,815	2,058	242							389 (89.8)	44 (10.2)					433
SUCR	2,076	2,441	365								1,102 (89.9)	123 (10.1)				1,226
WACA	1,896	2,106	210							431 (29.4)	1,036 (70.6)					1,468
WUPA	1,304	1,744	440				7,361 (51.1)	7,038 (48.9)								14,399
YUHO	1,767	1,805	39							14 (100)						14
<b>Network</b>	<b>348</b>	<b>3,081</b>	<b>2,732</b>	<b>6,563</b> (0.6)	<b>21,071</b> (1.8)	<b>41,965</b> (35.3)	<b>263,407</b> (22.1)	<b>320,500</b> (27.0)	<b>217,007</b> (18.2)	<b>131,779</b> (11.1)	<b>113,629</b> (9.6)	<b>46,482</b> (3.9)	<b>25,140</b> (2.1)	<b>1,624</b> (0.1)	<b>38</b> (<0.1)	<b>1,189,205</b>

### Climate Information for SCPN Park Units

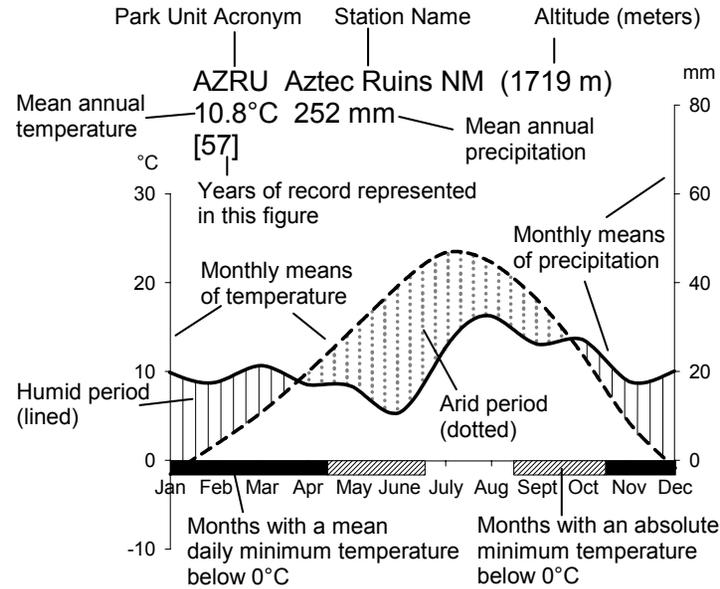
**Table D3. Selected climate data from National Weather Service Cooperative Network stations at or near Southern Colorado Plateau Network Parks, Monuments, and Recreation Areas.** Values are averaged based on data obtained from the Western Regional Climate Center (<http://www.wrcc.dri.edu/climsum.html>). Seasons are defined ecologically following Comstock and Ehleringer (1992).

Park	NWS Station Name	Elevation (m)	Latitude (dd mm N)	Longitude (dd mm W)	Period of Record	Years of Record	Average Total Precipitation				Mean Temperature			
							Annual (mm)	Oct-Feb (mm)	Mar-May (mm)	Jun-Sep (mm)	Annual (°C)	Oct-Feb (°C)	Mar-May (°C)	Jun-Sep (°C)
AZRU	Aztec Ruins N. M.	1719	36 50	108 00	1914 – present	89	252	102	55	94	10.8	-5.3	10.1	20.9
BAND	Bandelier N. M.	1847	35 47	106 16	1946 – 1976	35	382	114	66	202	10.1	2.6	9.7	19.8
CACH	Canyon de Chelly	1710	36 09	109 32	1970 – present	33	225	97	46	82	11.8	4.1	11.4	21.9
CHCU	Chaco Canyon N. M.#	1884	36 02	107 54	1922 – present	80	225	81	41	103	9.8	2.0	9.0	20.0
ELMA	Grants Airport*	1987	35 10	107 54	1953 – present	50	266	83	39	145	10.1	2.9	9.4	19.6
ELMO	El Morro N. M.	2204	35 03	108 21	1938 – present	65	352	121	62	168	8.6	1.8	7.6	17.9
GLCA	Hans Flat Ranger Station, UT*	2010	38 15	110 10	1980 – present	23	248	94	56	99	10.8	2.9	9.9	21.5
GLCA	Page	1301	36 56	111 27	1957 – present	46	162	73	38	52	14.6	6.1	14.1	25.6
GRCA	Grand Canyon N. P.	2070	36 03	112 09	1976 – present	27	432	181	93	156	8.6	2.4	7.2	17.4
GRCA	Jacob Lake*	2387	36 44	112 13	1950 – 1987	37	526	202	133	190	7.1	0.8	5.2	16.2
GRCA	Phantom Ranch	783	36 06	112 06	1966 – present	37	238	109	44	85	20.6	12.6	20.3	30.7
HUTR	Ganado*	1932	35 43	109 34	1948 – present	55	269	105	51	114	9.3	2.0	8.1	19.1
MEVE	Mesa Verde N. P.	2167	37 12	108 29	1948 – present	55	453	203	101	149	9.6	2.5	8.2	19.6
NAVA	Betatakin	2222	36 41	110 32	1948 – present	55	301	132	56	113	9.9	2.8	8.5	20.0
PEFO	Petrified Forest N. P.	1661	34 49	109 53	1948 – present	55	243	87	38	119	12.7	5.4	11.7	22.4
PETR	Albuquerque WSFO Airport*	1618	35 03	106 37	1914 – present	89	219	65	42	113	13.6	5.6	13.1	23.5
RABR	Navajo Mountain*	1835	37 01	110 48	1956 – 1975	19	233	134	38	61	9.8	2.2	8.5	20.2
SAPU	Mountainair*	1987	34 31	106 15	1914 – present	89	362	103	58	200	10.8	4.0	10.0	19.8
SUCR	Sunset Crater N. M.	2128	35 22	111 32	1969 – present	34	426	159	72	195	7.7	1.1	6.7	16.7
WACA	Flagstaff WSO AP*	2134	35 08	111 40	1950 – present	53	542	236	108	197	7.7	1.6	6.1	16.6
WUPA	Wupatki N. M.	1497	35 31	111 22	1948 – present	55	209	66	35	109	8.2	6.5	13.9	24.5
YUHO	Cortez*	1893	37 22	108 33	1929 – present	75	330	137	77	116	9.3	1.7	8.4	19.4

\* Station not in park

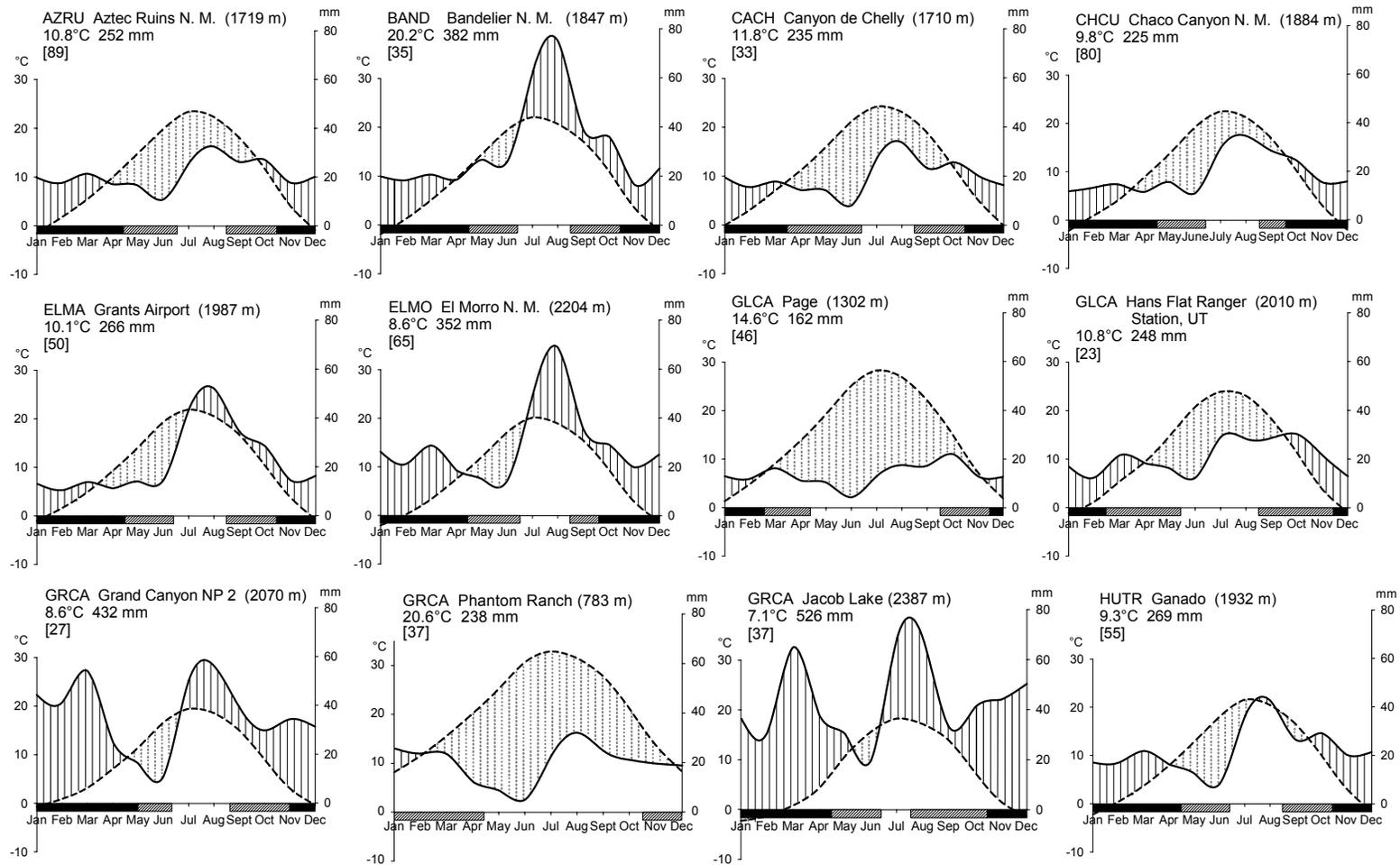
# Chaco Canyon NM = Chaco Culture National Historic Park

Walter Climate Diagrams (Walter 1963, 1979; Walter et al. 1975) provide a convenient way to summarize and compare climate among sites (Figure D1). Data for Walter Climate Diagrams was obtained from National Weather Service weather station sites in or near each park unit.



**Figure D1. Climate diagrams for Southern Colorado Plateau Network parks.** Data were collected at National Weather Service Cooperative Network Stations and acquired from the Western Regional Climate Center (<http://www.wrcc.dri.edu/climsum.html>). Format of diagrams based on Walter (1963).

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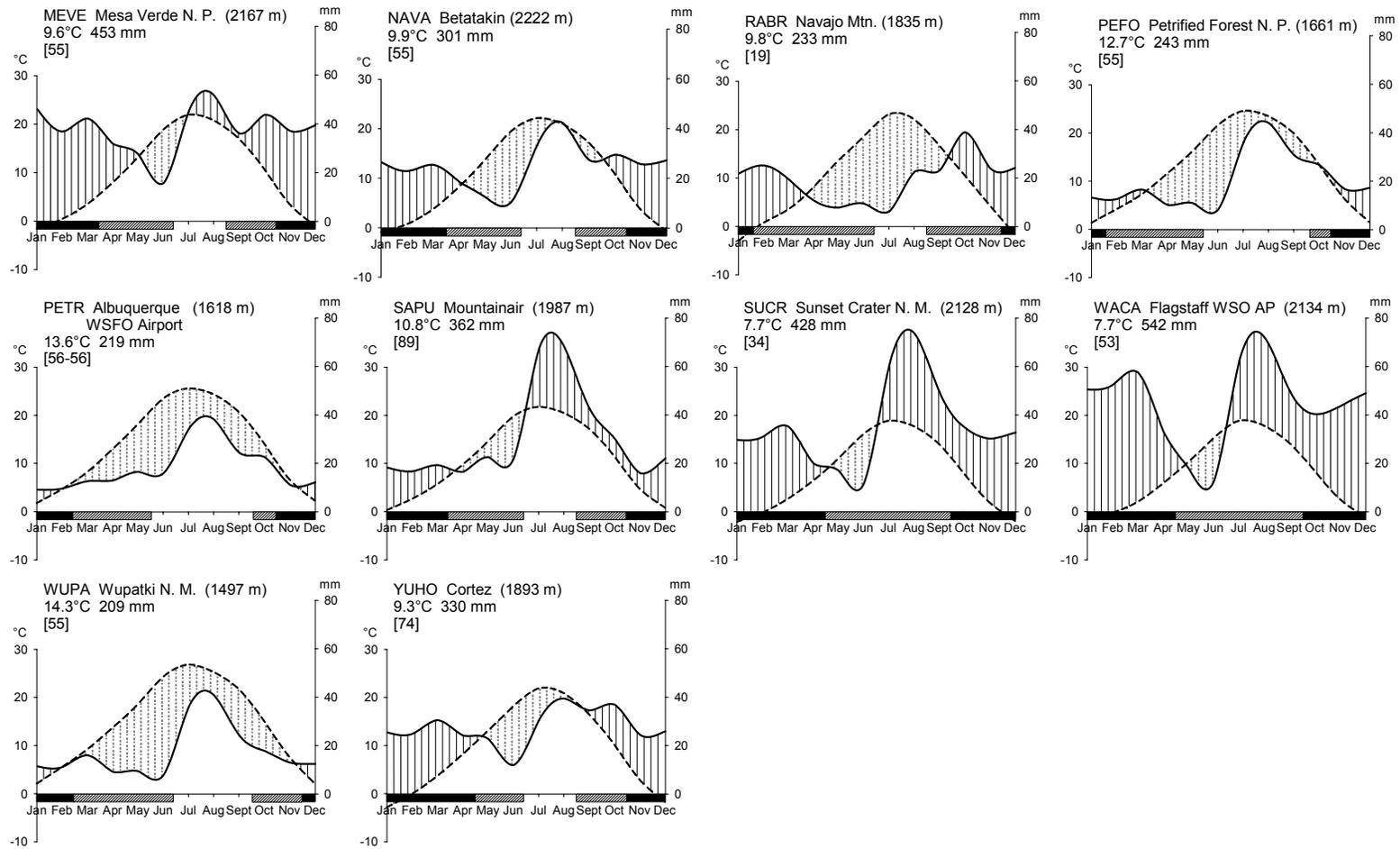


Figure D1. Cont' Climate diagrams for Southern Colorado Plateau Network parks.

### Vegetation Information for SCPN Parks

**Table D4. Preliminary list of vegetation types in Southern Colorado Plateau Network parks. Numbers represent estimated percentage of park area. Lower case “x” indicates that the vegetation type likely occurs within that park, but insufficient spatial data exists with which to estimate area extent of these types. Information in this table is based on the sources listed below the table.**

Vegetation Type	AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA	WUPA	YUHO
<b>Forest and Woodland Types</b>																			
Mixed-conifer and mixed-conifer spruce		41					x	2			x								
Spruce-fir forest			x					<1			x								
Aspen		<1						<1		<1	x								
Douglas fir forest																			
Ponderosa pine		14			40	2		8		<1	x					37	39		
Pinyon-juniper woodland	x	19*	45	9	10*	32	8	23*		45*	x				48	<1	34*		x
Douglas fir-Gambel oak woodland										6							11		
Juniper-shrub woodland		5		15	9	39	1	6				<1	x		24			12	
Oak woodland						x	x												
<b>Shrublands</b>																			
Montane shrubland ( <i>Artemisia nova</i> + others)				13															
Oak shrubland		1			4		?	5		40									
Sagebrush communities ( <i>Artemisia spp.</i> )	x		8	1		<1	8	6		3	x	10	x		<1			5	x
Greasewood communities ( <i>Sarcobatus vermiculatus</i> )				9								<1							x
Snakeweed communities ( <i>Gutierrezia spp.</i> )			x				x	11	x				x				1	1	x
Saltbush communities ( <i>Atriplex spp.</i> )	x		x			1	47	1	x	<1	x	<1			<1			<1	x
Blackbrush communities ( <i>Coleogyne ramosissima</i> )							24	14			x			91					
Mormon tea communities ( <i>Ephedra spp.</i> )							1	9										1	
Brittlebush communities ( <i>Encelia spp.</i> )								8											
Creosote bush ( <i>Larrea tridentata</i> )								1											
Rabbitbrush communities ( <i>Chrysothamnus spp.</i> )			x			15			x	x		20						12	x
Apache plume ( <i>Fallugia paradoxa</i> )							?												
Desert scrub								5										2	
<b>Grasslands</b>																			
Montane grassland		<1								4									
Grassland-shrub communities			6		3		?	2							4		1		
Grassland communities (unspecified grasses)		5					?	<1							5				
Galleta grassland ( <i>Pleuraphis jamesii</i> )	x		x	22			x	<1			x		x					25	x
Galleta/Blue grama grasslands ( <i>P. jamesii</i> , <i>B. gracilis</i> )												17							
Alkali sacaton grassland ( <i>Sporobolus airoides</i> )				30		2						7	x		<1				

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Vegetation Type	AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA	WUPA	YUHO
Black grama grassland ( <i>Bouteloua eriopoda</i> )						2		<1					x						9
Blue grama grassland ( <i>Bouteloua gracilis</i> )	x														1		<1		
Wheatgrass grassland ( <i>Agropyron spp.</i> )										x					<1				
Needle-and-Thread grassland ( <i>Hesperostipa</i> )			x																2
Sand bluestem grassland ( <i>Andropogon hallii</i> )																4			
Riparian and wetlands																			
Riparian-evergreen and evergreen/deciduous	x	1	x		2		x												
Riparian and ephemeral wash communities			x	2			1	x	x	<1	x	<1	x		3				
Canyon bottom communities			10				x	x										3	
Tamarisk or Russian olive riparian	x		x	x			x		x			<1							<1
Wetland/spring/seep herbaceous communities	x	<1	<1	<1			<1	x		x	x				x		x	x	x
Sparsely Vegetated																			
Ponderosa pine/lava					11											6			
Talus communities		<1	5					x											
Active dunes			x	1								7							
Cinder sparse or barren																31		<1	
Apache plume sparse																3		7	
Lava beds and lava/volcanic sparse					16								?			18			
Shale/sandstone sparse complex																	2	19	
Canyon wall complex and rocky barrens		13	27	2	5	4		x		2							8		
Badlands												27							
Desert pavement												<1							
Water							19							9					

\* indicates fire is, or should be, a natural part of the pinyon-juniper system in this park

- AZRU: (Stuart 2000), Appendix A
- BAND: GIS data obtained from the park - veg81\_a
- CACH: GIS data obtained from the Albuquerque GIS office, based on (Harlan and Dennis 1976)
- CHCU: (Floyd-Hanna and Hanna 1995)
- ELMA: GIS data obtained from the park – malveg\_94
- ELMO: GIS data obtained from Albuquerque GIS office, assumed to be based on (McCallum 1981)
- GLCA: GIS data downloaded from NPS GIS clearinghouse – glca\_vegetation, and (Stuart 2000), Appendix A
- GRCA: GIS data obtained from the park – grca\_veg\_68
- HUTR: (Froeschauer-Nelson 1998)

- MEVE: GIS data obtained from the park – lfhveg (produced by L. Floyd-Hanna 1996)– half of the park has been affected by severe drought and wildfire since 1996
- NAVA: GMP/EIS
- PEFO: GIS data obtained from the park – pefoveg2
- PETR: (Parmenter and Lightfoot 1996)
- RABR: GLCA GIS data
- SAPU: GIS data downloaded from NPS GIS clearinghouse – abo\_veg83, gqveg, and Quarai\_veg83
- SUCR: draft USGS-NPS vegetation map
- WACA: draft USGS-NPS vegetation map
- WUPA: draft USGS-NPS vegetation map
- YUHO: pers. comm. G. San Miguel

### Threatened and Endangered Species Information for SCPN Parks

**Table D5. Taxa that occur on National Park Service units of the Southern Colorado Plateau Network and currently have federal Endangered Species Act (ESA) status\*, Navajo Nation\*\*, or state status\*\*\*.** If a species has state status, it is only marked in the table for the parks that occur within that state. Table is based on information in the National Park Service species database as of November 2005. For bird species, this list does not differentiate between birds observed during migration periods, and those breeding within park boundaries.

Taxonomic Group		Listed Status						Southern Colorado Plateau Parks*																			
Common Name	Scientific Name	ESA	Navajo Nation	AZ	CO	NM	UT	AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA	WUPA	YUHO	
<b>Amphibians</b>																											
Lowland leopard frog	<i>Rana yavapaiensis</i>			WC												X											
Jemez Mountains salamander	<i>Plethodon neomexicanus</i>					T			X																		
Northern leopard frog	<i>Rana pipiens</i>		E	WC						X					X												
<b>Birds</b>																											
American bittern	<i>Botaurus lentianosus</i>			WC											X				X								
American dipper	<i>Cinclus mexicanus</i>		E															X									
American redstart	<i>Setophaga ruticilla</i>			WC											X			X	X								
Baird's sparrow	<i>Ammodramus bairdii</i>			WC															X								
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	E	WC	T	T	T	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X
Belted kingfisher	<i>Ceryle alcyon</i>			WC						X					X			X	X					X		X	
Blue grouse	<i>Dendragapus obscurus</i>		E						X			X			X		X										
California condor	<i>Gymnogyps californianus</i>	XN		WC										X	X												
Common snipe	<i>Gallinago delicata</i>		E							X				X	X		X		X							X	
Ferruginous hawk	<i>Buteo regalis</i>		E	WC							X			X	X			X	X				X	X	X		
Golden eagle	<i>Aquila chrysaetos</i>		E							X	X							X									
Gray catbird	<i>Dumetella carolinensis</i>			WC						X					X				X							X	
Gray vireo	<i>Vireo vicinior</i>					T			X			X	X									X					
Great egret	<i>Ardea alba</i>			WC															X								
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	E	WC	T		T	X			X		X	X	X		X							X			
Northern goshawk	<i>Accipiter gentilis</i>			WC					X						X			X					X	X	X		
Osprey	<i>Pandion haliaetus</i>			WC											X				X								
Peregrine falcon	<i>Falco peregrinus</i>		E	WC		T	E		X			X	X	X	X			X					X	X	X		
Pine grosbeak	<i>Pinicola enucleator</i>			WC											X			X									
Snowy egret	<i>Egretta thula</i>			WC											X				X							X	
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	E	WC	E	E	E	X	X	X	X		X	X			X	X		X		X	X	X	X		
Swainson's hawk	<i>Buteo swainsoni</i>		E						X	X	X	X	X	X	X		X	X	X	X		X			X		
Western snowy plover	<i>Charadrius alexandrinus</i>			WC					X						X												
Whooping crane	<i>Grus Americana</i>	E			E									X			X										
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	C		WC			T	X	X	X			X	X				X									

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Taxonomic Group		Listed Status						Southern Colorado Plateau Parks																			
Common Name	Scientific Name	ESA	Navajo Nation	AZ	CO	NM	UT	AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA	WUPA	YUHO	
<b>Fish</b>																											
Bonytail chub	<i>Gila elegans</i>	E	E	WC			E							X	X												
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	E	E	WC			E							X													
Humpback chub	<i>Gila cypha</i>	E	E	WC			E							X	X												
Razorback sucker	<i>Xyrauchen texanus</i>	E	E	WC			E							X													
Roundtail chub	<i>Gila robusta</i>		E											X													
<b>Invertebrates</b>																											
Kanab ambersnail	<i>Oxyloma haydeni kanabensis</i>	E													X												
<b>Mammals</b>																											
Spotted bat	<i>Euderma maculatum</i>			WC		T		X	X		X	X	X		X			X						X	X		
<b>Reptiles</b>																											
Narrowhead garter snake	<i>Thamnophis rufipunctatus</i>			WC											X												
<b>Vascular plants</b>																											
Alcove bog orchid	<i>Platanthera zothecina</i>		E												X			X									
Alcove rock-daisy	<i>Perityle specuicola</i>						R							X													
Atwood's evening primrose	<i>Camissonia atwoodii</i>						R							X													
Barneby's goldeneye	<i>Heliomeris soliceps</i>						R							X													
Bluff phacelia	<i>Phacelia indecora</i>						R							X													
Brady pincushion cactus	<i>Pediocactus bradyi</i>	E	E	HS										X	X												
Cutler's milk-vetch	<i>Astragalus cutleri</i>						R							X													
Gooding onion	<i>Allium goodingii</i>		E	HS		E				X					X												
Greater yellow lady's slipper	<i>Cypripedium pubescens var. pubescens</i>					E			X																		
Higgins' spring-parsley	<i>Cymopterus acaulis higginsii</i>						R							X													
Jones cycladenia	<i>Cycladenia jonesii</i>	T												X													
Mancos milk-vetch	<i>Astragalus humillimus</i>	E	E														X										
Mesa Verde cactus	<i>Sclerocactus mesae-verdae</i>	T															X										
Navajo sedge	<i>Carex specuicola</i>	T	E	HS						X				X										X			
New Mexico raspberry	<i>Rubus neomexicanus</i>						P							X													
Oregon grape	<i>Mahonia repens</i>	E							X	X				X													

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Taxonomic Group		Listed Status						Southern Colorado Plateau Parks																			
Common Name	Scientific Name	ESA	Navajo Nation	AZ	CO	NM	UT	AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA	WUPA	YUHO	
Peeble's Navajo cactus	<i>Pediocactus peeblesianus</i> var. <i>peeblesianus</i>	E		HS											X				X								
Satin-tail	<i>Imperata brevifolia</i>						P							X													
Sentry milk-vetch	<i>Astragalus cremnophylax</i> var. <i>cremnophylax</i>	E		HS											X												
Sugarbowls	<i>Clematis hirsutissima</i>			HS											X			X									
Zuni fleabane	<i>Erigeron rhizomatus</i>	T							X																		

\*Endangered Species Act Status codes: E – Endangered; T – Threatened; XN – Experimental population, non-essential; C – Candidate

\*\*Navajo Nation codes: E – Endangered

\*\*\*State Status codes: E – Endangered; T – Threatened; WC – State of Arizona classification for a wildlife species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines; HS – State of Arizona classification for a plant species that is Highly Safeguarded: no collection allowed (note: State of Arizona does not use threatened or endangered designations. See [http://www.azgfd.com/w\\_c/edits/hdms\\_ranking\\_definitions.shtml](http://www.azgfd.com/w_c/edits/hdms_ranking_definitions.shtml)); R – State of Utah classification for plant species with known or suspected rangewide viability concern; P – State of Utah classification for plant species that are rare or uncommon in Utah (note: State of Utah does not use threatened or endangered designations for plants. See <http://dwr.cdc.nr.utah.gov/ucdc/ViewReports/plantrpt.pdf>)

# Per park request, raptor species for BAND were excluded from the table.

### Wilderness Designation Information for SCPN Park Units

**Table D6. SCPN parks with proposed, recommended, or designated wilderness. Area information (in hectares) was obtained from the National Park Service Wilderness Report (National Wilderness Steering Committee 2002) and from the NPS Intermountain Region Wilderness Summary (Intermountain Region of NPS 2002).**

Park	Status*				% of Total Park	Legislation
	Designated	Recommended	Proposed	Potential		
BAND	9,416				71	94-567
ELMA		4,517	43,196**		100	
GLCA			226,483**	18,829	48	
GRCA			448,916***	12,068	93	
MEVE	3,440				16	94-567
PEFO	20,340				53	91-504

\* Parks where wilderness studies have been completed and environmental compliance (for the wilderness proposal) is considered current. These parks theoretically require no further NEPA compliance. Recommendations have not been officially transmitted to the Secretary of the Interior for forwarding to the President/Congress.

\*\* Proposed Wilderness, i.e., the park has completed an environmental impact statement for the wilderness proposal, the NPS has forwarded its wilderness recommendation to the Secretary of the Interior, but the proposal has not yet been forwarded to the President/Congress.

\*\*\* Wilderness Studies and EIS's have been completed but acreage may not be current.

### Exotic Plant Information for SCPN Parks

**Table D7. Exotic plant species of resource concern for their aggressive ability to colonize natural areas.** The information included in the park specific columns portrays species occurrence based on current data in NPSpecies. All species listed were either introduced to North America (I) or have both native and introduced varieties or subspecies (NI). Nativity status was obtained from the USDA plants database (<http://plants.usda.gov/>).

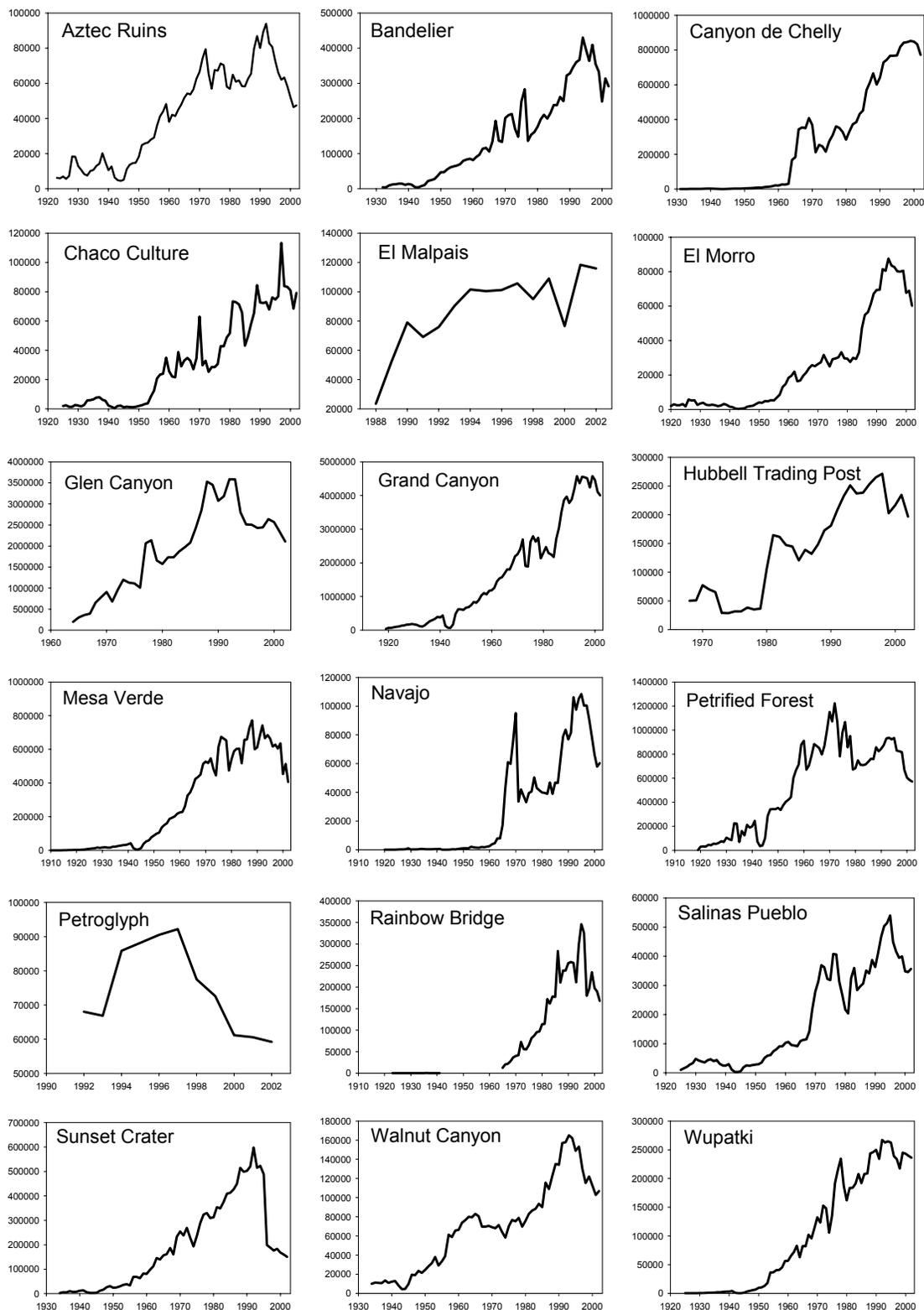
Scientific Name	Common Name	Nativity in US*	SCPN Parks																# of parks with documented species occurrences		
			AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR		WACA	WUPA
<i>Acroptilon repens</i> *	Russian knapweed	I	x	x	x	x	x		x	x		x								x	10
<i>Ailanthus altissima</i> *	tree-of-heaven	I		x							x		x								3
<i>Alhagi maurorum</i> *	camelthorn	I									x		x						x		3
<i>Arundo donax</i>	giant reed	I																			
<i>Brassica tournefortii</i>	Asian mustard	I									x										1
<i>Bromus inermis</i>	smooth brome	NI	x	x	x						x		x			x				x	8
<i>Bromus japonicus</i>	Japanese brome	I		x						x	x	x	x							x	7
<i>Bromus tectorum</i> *	cheatgrass	I	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	18
<i>Cardaria draba</i> *	whiteweed	I	x	x							x		x							x	6
<i>Carduus nutans</i> *	musk thistle	I		x	x		x					x	x							x	6
<i>Centaurea biebersteinii</i> *	spotted knapweed	I									x										1
<i>Centaurea calcitrapa</i> *	purple starthistle	I																			0
<i>Centaurea diffusa</i> *	diffuse knapweed	I											x								1
<i>Centaurea solstitialis</i> *	yellow starthistle	I									x										1
<i>Chondrilla juncea</i> *	rush skeletonweed	I									x										1
<i>Cirsium arvense</i> *	Canada thistle	I										x								x	2
<i>Cirsium vulgare</i> *	bull thistle	I		x	x		x		x	x	x	x	x					x		x	11
<i>Conium maculatum</i> *	poison hemlock	I																			0
<i>Convolvulus arvensis</i>	field bindweed	I	x	x	x		x		x	x	x	x				x		x		x	12
<i>Cynoglossum officinale</i> *	houndstongue	I									x		x								2
<i>Dactylis glomerata</i>	orchardgrass	I	x	x						x	x	x	x						x		8
<i>Descurainia sophia</i>	herb Sophia	I		x	x					x	x		x	x	x						8
<i>Elaeagnus angustifolia</i> *	Russian olive	I	x	x	x					x	x	x	x	x			x				10
<i>Euphorbia esula</i>	leafy spurge	I																			0
<i>Halogeton glomeratus</i>	saltlover	I									x										1
<i>Isatis tinctoria</i>	Dyer's woad	I																			0

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Scientific Name	Common Name	Nativity in US*	SCPN Parks																	# of parks with documented species occurrences		
			AZRU	BAND	CACH	CHCU	ELMA	ELMO	GLCA	GRCA	HUTR	MEVE	NAVA	PEFO	PETR	RABR	SAPU	SUCR	WACA		WUPA	YUHO
<i>Kochia scoparia</i> *		I	x	x	x	x	x	x	x	x	x	x	x	x	x						x	14
<i>Lepidium latifolium</i> *	perennial pepperweed	I								x	x		x									3
<i>Leucanthemum vulgare</i> *		I									x											1
<i>Linaria dalmatica</i> *	dalmatian toadflax	I								x	x									x		3
<i>Linaria vulgaris</i>	butter and eggs	I		x																		1
<i>Lythrum salicaria</i>	purple loosestrife	I																				0
<i>Marrubium vulgare</i> *	horehound	I	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	16
<i>Melilotus alba</i>	white sweet clover	I	x				x		x		x	x	x					x	x			8
<i>Melilotus officinalis</i>	yellow sweet clover	I	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		x	17
<i>Onopordum acanthium</i> *	Scotch thistle	I									x											1
<i>Poa pratensis</i>	Kentucky bluegrass	NI	x	x	x		x				x		x	x	x				x		x	10
<i>Rubus discolor</i> *	Himalayan blackberry	I									x											1
<i>Rumex crispus</i> *	curly dock	I	x	x	x		x				x		x				x		x			9
<i>Saccharum ravenna</i> *	ravenna grass	I								x	x											2
<i>Salsola collina</i> *	slender Russian thistle	I																				0
<i>Salsola kali</i> *	Russian thistle	I		x	x	x		x	x				x	x		x	x	x		x	x	12
<i>Salsola tragus</i> *	prickly Russian thistle	I	x	x		x	x	x	x	x	x	x	x	x		x		x	x			14
<i>Salvia aethiopis</i> *	Mediterranean sage	I							x	x												2
<i>Sonchus arvensis</i>	field sowthistle	I																				0
<i>Sorghum halepense</i> *	Johnson grass	I								x	x				x							3
<i>Tamarix spp.</i> *	salt cedar	I	x	x	x	x	x	x	x	x	x	x	x	x		x	x			x		15
<i>Tragopogon dubius</i>	goatsbeard, salsify	I		x		x	x	x	x	x	x	x	x			x	x	x	x			13
<i>Verbascum thapsus</i> *	common mullein	I	x	x		x	x	x	x	x		x	x				x	x	x			12
<i>Taraxacum officinale</i> *	common dandelion	NI	x	x	x		x	x	x	x	x	x	x				x	x		x		14
<i>Tribulus terrestris</i> *	puncturevine	I	x	x	x	x	x	x	x	x	x		x	x					x			12
<i>Ulmus pumila</i> *	Siberian elm	I	x		x		x		x	x	x	x	x		x	x						9

\*Species listed by SCPN parks as species of resource concern during a survey of parks conducted by Karen Beppler-Dorn (in prep.). This information is preliminary as responses from some parks were incomplete. Note: some parks listed species that are not currently documented as present within the park.

### Visitor Information and Statistics for SCPN Park Units



**Figure D2. Visitation statistics for the park units of the Southern Colorado Plateau Network.** Yucca House is not portrayed because there are no facilities or park staff at that unit. Note the different scales on the axes for each park. Data source: National Park Service, Public Use Statistics Office: (<http://www2.nature.nps.gov/stats/>).