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Western Great Plains Sandhill Steppe

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Shrubland

Map Zone

26

Model Splits or Lumps

This Biophysical Setting (BpS) is lumped with 2611330.

Geographic Range

This system is found mostly in southcentral areas of the Western Great Plains Division ranging from the Nebraska Sandhills region south to central Texas, although some examples may reach as far north as the Badlands of South Dakota.

Biophysical Site Description

The climate is semi-arid to arid for much of the region in which this system occurs. This system is found on somewhat excessively to excessively well-drained, deep sandy soils that are often associated with dune systems and ancient floodplains. In some areas today, this system may actually occur as a result of overgrazing in Western Great Plains Tallgrass Prairie (CES303.673) or Western Great Plains Sand Prairie (CES303.670).

Vegetation Description

This system is characterized by a sparse to moderately dense woody layer dominated by sand sagebrush (*Artemisia filifolia*). Associated species can vary with geography, amount and season of precipitation, disturbance, and soil texture. Several graminoid species such as sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), giant sandreed (*Calamovilfa gigantea*), needle-and-thread grass (*Hesperostipa comata*), and grama grass (*Bouteloua* spp.) can be connected with this system. Other shrub species may also be present, including soapweed yucca (*Yucca glauca*), mesquite (*Prosopis glandulosa*), skunkbush sumac (*Rhus trilobata*), and chickasaw plum (*Prunus angustifolia*). In the southern range of this system, havard oak (*Quercus havardii*) may also be present and represents one succession pathway that develops over time following a disturbance. *Q. havardii* is able to resprout following a fire and thus may persist for long periods of time once established.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ARFI2	<i>Artemisia filifolia</i>	Sand sagebrush
YUGL	<i>Yucca glauca</i>	Soapweed yucca
BOUTE	<i>Bouteloua</i>	Grama

Shrub	>3.0	B	B	B	B	B	B	B	B	B	B
Tree	0-5	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	5-10	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	10-25	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	25-50	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	>50	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 8 Early Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SPCR	<i>Sporobolus cryptandrus</i>	Sand dropseed	Upper
CAGI3	<i>Calamovilfa gigantea</i>	Giant sandreed	Upper

Description

Initial open dunes with tops stabilized by grass such as sand dropseed (*Sporobolus cryptandrus*) and giant reed grass (*Arundo donax*).

Maximum Tree Size Class

None

Class B 92 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUHA3	<i>Quercus havardii</i>	Havard oak	Upper
ARFL2	<i>Arnoglossum floridanum</i>	Florida cocalia	Mid-Upper
SCSC	<i>Schizachyrium scoparium</i>	Little bluestem	Low-Mid
SPCR	<i>Sporobolus cryptandrus</i>	Sand dropseed	Low-Mid

Description

Stabilized dunes from previous stage become colonized by animal dispersed seeds, primarily sand sage and shinnery (*Quercus havardii*). Fire disturbance is stand replacement (>75% shrub topkill) that is wind-driven. This replacement fire does not return B to the open dune stage; instead, it actually maintains B. Ignition from lightning. Decline of community caused by excessive drought which occurs every century or two.

Maximum Tree Size Class

None

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:OPN	0	Late1:OPN	30
Late1:OPN	31	Late1:OPN	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Wind or Weather or Stress	Early1:OPN	Early1:OPN	0.02	50	No	0
Wind or Weather or Stress	Late1:OPN	Early1:OPN	0.003	333	Yes	0
Replacement Fire	Late1:OPN	Late1:OPN	0.05	20	No	0

References

Arno, S.F. 2000. Fire in western forest ecosystems. Pages 97-120 in: J.K. Brown and J. Kapler-Smith, eds. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station. 257 pp.

Baker, W.L. and D.J. Shinneman. 2004. Fire and restoration of pinyon-juniper woodlands in the western United States. A review. Forest Ecology and Management 189: 1-21.

Barton, A.M. 2002. Intense wildfire in southeastern Arizona: transformation of a Madrean oak-pine forest to oak woodland. Forest Ecology and Management 165: 205-212.

Barton, A.M. 1999. Pines versus oaks: effects of fire on the composition of Madrean forests in Arizona. Forest Ecology and Management 120: 143-156.

Brown, D.E., editor. 1982. Biotic communities -- southwestern United States and northwestern Mexico. Desert Plants 4(1-4): 1-342.

Brown, J.K. and J. Kapler-Smith, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42. vol 2. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station. 257 pp.

DeBano, L.F., P.F. Ffolliott, A. Ortega-Rubio, G.J. Gottfried, R.H. Hamre and C.B. Edminster, technical coordinators. 1995. Biodiversity and management of the Madrean Archipelago: The Sky Islands of the southwestern United States and northern Mexico. General Technical Report RM-264. Fort Collins, CO: USDA Forest Service Rocky Mountain Experiment Station.

Dick-Peddie, W.A. 1993. New Mexico vegetation: past, present, and future. University of New Mexico Press, Albuquerque, NM. 244 pp.

Folliott, P.F., G.J. Gottfried, D.A. Bennett, V.M. Hernandez, A. Ortega-Rubio and R.H. Hamre, technical coordinators. 1992. Ecology and management of oak and associated woodlands: Perspectives in the Southwestern United States and Northern Mexico. General Technical Report RM-218. Fort Collins, CO: USDA Forest Service Rocky Mountain Experiment Station.

Folliott, P.F. and others, technical coordinators. 1996. Effects of fire on Madrean Province ecosystems. Proceeding from the second conference on the Madrean Archipelago/Sky Island ecosystem, 11-15 March 1996, Tucson, AZ. General Technical Report RM-GTR-289. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 277 pp.

Germaine, H.L. and G.R. McPherson. 1999. Effects of biotic factors on emergence and survival of *Quercus emoryi* at lower treeline. *Ecoscience* 6: 92-99.

Gruell, G.E. 1999. Historical and modern roles of fire in pinyon-juniper. Pages 24-28 in: S.B. Monsen, R. Stevens, R.J. Tausch, R. Miller and S. Goodrich, compilers. Proceedings: ecology and management of pinyon-juniper communities within the Interior West. 15-18 Sept 1997, Provo, UT. Proceedings RMRS-P-9. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

Haworth, K. and G.R. McPherson. 1994. Effects of *Quercus emoryi* on herbaceous vegetation in a semi-arid savanna. *Vegetation* 112: 153-159.

Kuchler, A.W. 1964. Potential Natural Vegetation of the Conterminous United States. American Geographic Society Special Publication No. 36. 116 pp.

McClaran, M.P. and G.R. McPherson. 1999. Oak savanna of the American Southwest. Pages 275-287 in R.C. Anderson, J.S. Fralish and J. Baskin (editors), *Savannas, Barrens, and Rock Outcrop Plant Communities of North America*. Cambridge University Press, Cambridge, England.

McNab, W.H. and P.E. Avers. 1994. Ecological subregions of the United States: section descriptions. USDA Forest Service, Ecosystem Management, Washington DC. WO-WSA-5. 250 pp. plus appendices and maps.

McPherson, G.R. and J.F. Weltzin. 1998. Response of understory to overstory removal in southwestern oak woodlands. *Journal of Range Management* 51: 674-678.

McPherson, G.R. and J.F. Weltzin. 2000. The role and importance of disturbance and climate change in U.S./Mexico borderlands: a state-of-the-knowledge review. General Technical Report RMRS-GTR-50. USDA Forest Service, Rocky Mountain Research Station.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

NatureServe. 2004. International Ecological Classification Standard: Terrestrial Ecological Classifications. Terrestrial ecological systems of the Great Basin US: DRAFT legend for Landfire project. NatureServe Central Databases. Arlington, VA. Data current as of 4 November 2004.

Powell, A.M. 1994. Grasses of the Trans-Pecos and adjacent areas. Austin, TX: University of Texas Press. 377 pp.

Powell, A.M. 1998. Trees and shrubs of the Trans-Pecos and adjacent areas. Austin, TX: University of Texas Press. 498 pp.

Romme, W.H., L. Floyd-Hanna and D. Hanna. 2003. Ancient pinyon-juniper forests of Mesa Verde and the West: a cautionary note for forest restoration programs. Pages 335-350 in: P.N. Omi and L.A. Joyce. tech. eds. Fire, fuel treatments, and ecological restoration: conference proceedings. 16-18 April 2002. Fort Collins, CO. Proceedings RMRS-P-29. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 475 pp.

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann and D.L. Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 41 pp. + CD.

Schussman, H. and E. Smith. 2006. Historical range of variation and state and transition modeling of historic and current landscape conditions for potential natural vegetation types of the Southwest. Southwest Forest Association Project. The Nature Conservancy Arizona report.

Soule, P.T. and P.A. Knapp. 1999. Western juniper expansion on adjacent disturbed and near-relict sites. *Journal of Range Management* 52: 525-533.

Soule, P.T. and P.A. Knapp. 2000. *Juniperus occidentalis* (western juniper) establishment history on two minimally disturbed research natural areas in central Oregon. *Western North American Naturalist* (60)1: 26-33.

Swetnam, T.W. and C.H. Baisan. 1994. Historical fire regime patterns in the southwestern United States since AD 1700. Pages 11-32 in: C.D. Allen, ed. Fire effects in southwestern forests: proceedings of the second La Mesa fire symposium. General Technical Report RM-GTR-286. Fort Collins, CO: USDA Forest Service Rocky Mountain Forest and Range Experiment Station.

Swetnam, T.W. and C.H. Baisan. 1996. Fire histories of montane forests in the Madrean Borderlands. Pages 15-36 in: P.F. Ffolliott and others, technical coordinators. Effects of fire on Madrean Province ecosystems. Proceeding from the second conference on the Madrean Archipelago/Sky Island ecosystem, 11-15 March 1996, Tucson, AZ. General Technical Report

RM-GTR-289. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 277 pp.

Tausch, R.J. and N.E. West. 1987. Differential establishment of Pinyon and Juniper following fire. *American Midland Naturalist* 119(1): 174-184.

USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System, [Online]. Available: <http://www.fs.fed.us/database/feis/> [Accessed: 11/15/04].

Webster, G.L. and C.J. Bahre (editors) 2001. *Changing Plant Life of La Frontera: Observations on Vegetation in the United States/Mexico Borderlands*. University of New Mexico Press, Albuquerque. 260 pp.

Weltzin, J.F. and G.R. McPherson. 1999. Facilitation of conspecific seedling recruitment and shifts in temperate savanna ecotones. *Ecological Monographs* 69: 513-534.

Weltzin, J.F. and G.R. McPherson. 2000. Implications of precipitation redistribution for shifts in temperate savanna ecotones. *Ecology* 81: 1902-1913.

Wright, H.A., L.F. Neuenschwander and C.M. Britton. 1979. The role and use of fire in sagebrush-grass and pinyon-juniper plant communities. Gen. Tech. Rep. INT-GTR-58. Ogden, UT: USDA Forest Service, Intermountain Research Station. 48 pp.