Ecological site R053AE062MT
Sandy (Sy) (Legacy)
RRU 53AE

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site usually occurs on undulating to rolling till plains, low terraces, fans and flood plains. Slopes vary from 0- 12%, but are usually less than 8%. Elevations generally range from 2,000 to 3,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Till plain (3) Terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	490 – 1,070 m
Slope	0 – 10 %
Aspect	Aspect is not a significant factor

Climatic features

A semi-arid, temperate climate characterizes the Glaciated Plains. The predominance of cool season species has evolved to take advantage of the precipitation regime that peaks in late spring-early summer (June). Seventy-five percent of the annual precipitation usually falls as steady, soaking, frontal system rains. Summer rains usually come with thunderstorms. Precipitation is the most important factor influencing production (Heitschmidt et al 2005). Severe drought occurs on average in two out of every ten years (Cooper, et al., 2001).

Table 3 Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	140 days
Precipitation total (average)	360 mm

Influencing water features

Soil features

These soils formed from alluvium or eolian deposits. The surface layer of these soils varies from 0-9 inches in depth and typically have a fine sandy loam or sandy loam texture. Underlying horizons often have silt loam, sandy loam, loam, sandy clay loam, loamy fine sand, and loamy sand textures. The depth of coarse textured soil needs to be 20 inches or greater. Soils are well to somewhat excessively drained. Permeability varies from very slow to moderately rapid. Soil ph varies from 6.6 to 8.4. The following soil components characterize this site: Glendive, Fortbenton, Chinook, Dooley, Parshall, Tally, Trembles, Busby and Kenilworth.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Coarse sandy loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow to moderately rapid
Soil depth	50 – 180 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 17.78 cm

Electrical conductivity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

This ecological site developed through time under the influence of climate, geologic parent materials, fire, plants and animals. Research consistently shows that precipitation is the principal factor altering productivity on ecological sites in the Northern Great Plains (Heitschmidt et al. 2005). The same authors concluded that grazing reduces herbage standing crop, whereas its effects on above ground net primary production varies with timing of grazing and precipitation events, along with the functional and structural composition of the plant community.

It is believed that, prior to the arrival of European man, fire occurred on 5-7 year interval (Frost 1998). These fires were ignited by lightning and by early man in his attempts to manipulate the environment. Clearly, the current role of fire on the Glaciated Plains is much reduced from its historical importance.

Plant community interpretations are based on the Historic Climax Plant Community (HCPC). The HCPC was determined by evaluating rangeland relic areas, and other areas protected from excessive disturbance. The HCPC is comprised of a mixture of cool and warm season perennial grasses, forbs and shrubs. About 85% of the annual production is from grasses and grasslike plants, most of which is produced during the cool season. Forbs and shrubs contribute 10% and 5%, respectively, to total annual production. Total annual production averages 1600 lbs/ac during normal years.

This site is moderately resistant and resilient to disturbances. Departures from the HCPC generally result from management actions, drought, a change in the natural fire regime, colonization and recruitment of noxious weeds, etc.. As the HCPC regresses to lower seral stages, the deep-rooted perennial grasses such as little bluestem and prairie sandreed are replaced by blue grama, sandberg bluegrass, fringed sagewort, scurfpeas, threadleaf sedge, hairy gold aster, green sagewort, and many flowered aster. In early seral stages, the dominance of these short grasses, warm season forbs and half-shrubs in the plant community disrupts ecological processes, impairs the biotic integrity of the site, and adversely affects resiliency. The site becomes more susceptible to erosion. The system’s ability to recover to higher seral states is restricted or impeded.

State and Transition Diagram

Successional pathways of the Sandy 10-14” p.z. ecological site cannot be satisfactorily described using traditional theories of plant succession leading to a single climax community (Briske et al. 2005). This ecological site is more aptly described using state-and-transition vegetation dynamics in a non-linear framework. A “state” is an alternative, persistent vegetation community that is not simply reversible in the linear successional framework. States are depicted as seral stages, while pathways between states are “transitions.” As the HCPC regresses to an early seral state, it is theorized that a threshold is crossed somewhere within the mid seral state. Plant communities occurring below this threshold are in a steady state. Transitions may be triggered by climatic events, fire, grazing, farming, burning, etc.

Three important plant communities and the successional pathways within the Reference State (State #1) are shown in the following diagram. In addition, transitions from Community B (State #1) to State #2 (Community C) and State #3 (Community D) are also illustrated. The diagram also depicts a third transition from State 1 (Reference State) to State #4. Ecological processes are discussed in the plant community descriptions, which follow the diagram.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Native perennial grasses**			1-1524	
	prairie sandreed	CALO	*Calamovilfa longifolia*	359-717	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	269-448	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90-359	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	1-269	–
	little bluestem	SCSC	*Schizachyrium scoparium*	112-269	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	1-112	–
	green needlegrass	NAVI4	*Nassella viridula*	1-90	–
2	**Native perennial grasses**			179-359	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	90-179	–
	western wheatgrass	PASM	*Pascopyrum smithii*	90-179	–
3	**Native perennial grasses and grasslikes**			1-90	
	Grass, perennial	2GP	*Grass, perennial*	1-22	–
	blue grama	BOGR2	*Bouteloua gracilis*	1-22	–
	threadleaf sedge	CAFI	*Carex filifolia*	1-22	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	1-22	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	1-22	–
	Sandberg bluegrass	POSE	*Poa secunda*	1-22	–
Forb					
4	**Native perennial forbs**			36-179	
	dotted blazing star	LIPU	*Liatris punctata*	18-90	–
	American vetch	VIAM	*Vicia americana*	18-90	–
5	**Native perennial forbs**			36-179	
	white prairie clover	DACA7	*Dalea candida*	18-90	–
	purple prairie clover	DAPU5	*Dalea purpurea*	18-90	–
6	**Native perennial forbs**			1-90	
	Forb, perennial	2FP	*Forb, perennial*	1-22	–
	common yarrow	ACMI2	*Achillea millefolium*	1-22	–
	tarragon	ARDR4	*Artemisia dracunculus*	1-22	–
	milkvetch	ASTRA	*Astragalus*	1-22	–
	buckwheat	ERIOG	*Eriogonum*	1-22	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	1-22	–
	beardtongue	PENST	*Penstemon*	1-22	–
	spiny phlox	PHHO	*Phlox hoodii*	1-22	–
	scurfpea	PSORA2	*Psoralidium*	1-22	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	1-22	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	18-22	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	1-22	–
	manyflowered aster	SYERP2	*Symphyotrichum ericoides var. pansum*	1-22	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	1-22	–

	lesser spikemoss	SEDE2	*Selaginella densa*	0-1	–
Shrub/Vine					
7	**Native shrubs and half-shrubs**			18-90	
	winterfat	KRLA2	*Krascheninnikovia lanata*	18-90	–
8	**Native shrubs and half-shrubs**			18-67	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	18-28	–
	silver sagebrush	ARCA13	*Artemisia cana*	18-28	–
	prairie sagewort	ARFR4	*Artemisia frigida*	18-28	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	18-28	–
	rose	ROSA5	*Rosa*	18-28	–
	snowberry	SYMPH	*Symphoricarpos*	18-28	–
9	**Native shrubs and half-shrubs**			0-1	
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-1	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Livestock Management This site evolved with trampling and defoliation (bison, elk, deer, antelope, prairie dogs, grasshoppers, jackrabbits, and other herbivores), fire and drought. The site is highly resistant to disturbances which may alter its ecological processes. It is also resilient. Following perturbations such as drought, which allows blue grama and other increasers to increase at the expense of the mid and tall grasses, succession occurs with subsequent rainfall. Thus, the HCPC, or Communities A or B may be present at any given time in State #1. The site has the potential to produce 1,600 lbs/ac. Forage production shows far greater variations in response to changes in annual precipitation than to different grazing intensities (Heitschmidt et al. 2005). However, proper stocking rates and prescribed grazing is needed to ensure that the site remains in State #1. Without proper grazing management the mid-to-tall grass community will regress to a blue grama, prairie junegrass, dense clubmoss community. In comparison to the HCPC, suggested stocking rates for communities in States #2 & #3 represent a 4-fold reduction. Experience indicates that prescribed grazing prevents further deterioration in States #2 & #3. However, prescribed grazing normally will not guarantee significant plant succession (in States #2 & #3) unless the clubmoss and blue grama sod is reduced by mechanical treatments. Very few livestock losses are reported from poisonous plants. Wildlife Interpretations The Sandy 10-14" p.z. ecological site that is in a high seral state or HCPC (State #1) provides forage for mule deer and antelope during most of the year. However, the overall forage potential is limited by the relatively low production and diversity of forbs and shrubs. Low shrub cover also limits the potential of the site for thermal and escape cover. Most deer use occurs along the edges of the site where it borders woody draws, badland range sites, etc. Species diversity and cover associated with either the high seral or HCPC states also provide habitat for sharp-tailed grouse and other upland birds. Most wildlife usage occurs along the transitions between the sandy site and woodland draws. The relative absence of big sagebrush and silver sagebrush limits the potential of this site for sage grouse habitat. Species diversity and litter also provide favorable habitats for deer mice, rabbits and other small mammals. Golden eagles, redtail and ferruginous hawks are often circling over the landscape searching for prey. Communities that are in States #2 and #3 are much less suitable for big game, upland birds and most species of small mammals. However, they are more suitable for prairie dogs. Prairie dog towns also have potential for use by burrowing owls, mountain plovers, and other wildlife species. Lands in State #4 that were seeded under the CRP program provide valuable forage and cover for upland birds, deer and antelope, Plant Preferences by Animal Kind Refer to NRCS Field Office Technical Guide, Section IIE, General Information, for tables displaying plant preferences by livestock and wildlife.

Hydrological functions

Soils associated with this ecological site are mostly in Hydrologic Soil Group B (with a few in Groups A and C). Infiltration rates are generally moderate. The runoff potential is also low to moderate, depending on slope and ground cover. Good hydrologic conditions exist on plant communities that are either in a high seral state or are at HCPC (State #1). Canopy cover (grass, forbs and shrubs) is greater than 90% in these communities, which is conducive to high infiltration rates and minimizes runoff and erosion. Communities in early seral states (States #2 and #3) are generally considered to be in poor hydrologic condition. Concerns are valid. The dense clubmoss and blue grama restrict the ability of the desirable tall and mid-grasses to utilize available moisture. Although erosion is probably minor at locations where the site produces mid and tall, cool-season grasses, or a dense clubmoss and bue grama, wind and water erosion is a major concern when the amount of bare ground exceeds litter. Excess bare ground results when States #2 and #3 have been subjected to excessive grazing by livestock, prairie dogs, insects, extreme drought or wild fire.

Recreational uses

Hunters are probably the most common recreational user of this ecological site. The site is also used by hikers and photographers. Many “classy” photographs of the Northern Great Plains exploit the stark and contrasting beauty of yuccas, little bluestem and/or prairie sandreed.

Wood products

This site has no significant value for wood products.

Other products

This site is suitable for livestock grazing from May through October. Because tall and mid grasses comprise about 85% of the production, the site is better-suited for cattle, rather than sheep grazing.

Other information

The Sandy 10-14” p.z. ecological site in the eastern Glaciated plains is resistant to perturbations. However, the site loses its resiliency when the plant community regresses from a high to an early seral state. As the site moves from HCPC to lower seral communities, reproductive capability of the higher successional plants is restricted. Annual production in early seral states is less than 25% of the sites’ potential, which adversely affects amount of litter and the number of structural/functional plant groups.

Inventory data references

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Approval

Kirt Walstad, 4/29/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	03/30/2005
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: Rills should not be present in HCPC. If in plant community A, careful examination will yield slight evidence of rills that are less than ½ inch deep, linear, but short in length. If in plant community B, rills would be visible, ½ inch deep or more, linear, rarely exceeding 1 foot in length. Distance between rills is irregular. If in plant community B, rills would be visible.**

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2. **Presence of water flow patterns: Water flow patterns should not be observable in HCPC. If in plant community A, careful examination will yield short discontinuous water flow patterns. If in plant community B, water flow patterns would be visible as long (more than 1feet) and continuous across the landscape.**

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3. **Number and height of erosional pedestals or terracettes: Pedestals or terracettes would essentially be nonexistent in HCPC. If in plant community A, careful examination on slopes > 8% yield occasional pedestals and terracettes approximately ¼ inch above the soil surface. If in plant community B on slopes > 8%, pedestals and terracettes are frequent and ½ - ¾ inch above the soil surface.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Less than 5% of the soil surface should be bare in HCPC. Bare ground should be less than 2" in diameter. If in plant community A, 5-10% of the soil surface can be exposed. If in plant community B, 20% of the soil surface can be exposed.**

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5. **Number of gullies and erosion associated with gullies:** **Gullies are not associated with any of the State 1 reference plant communities.**

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6. **Extent of wind scoured, blowouts and/or depositional areas:** **Wind scoured, blowouts and/or depositional areas are not associated with any of the State 1 reference plant communities.**

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7. **Amount of litter movement (describe size and distance expected to travel):** **Litter movement is not expected with HCPC or plant community A. If in plant community B, litter, both fine and coarse, movement is visible, especially on slopes > 8%, but the distance moved is less than 1 foot.**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** **Stability class anticipated to be 4 or 5 if the surface texture is sandy loam and 5 or 6 is the surface texture is fine sandy loam or loamy find sand.**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **The surface layer is 0-9" deep. The color ranges from light brownish gray, grayish brown, dark grayish brown and dark brown. Surface textures include fine sandy loam, sandy loam and loamy fine sand. Soil organic matter ranges from 1-3% with a high of 4% and a low of 0.5%.**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **In HCPC, 95% plant canopy and 80-85% basal cover with small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. Healthy, deep rooted native grasses enhance infiltration and reduce runoff. Infiltration rate is rapid. If in plant community A, 90-95% plant canopy and 70-80% basal cover with small gaps between plants will still reduce raindrop impact and decrease overland flow. If in plant community B, 40-70% plant canopy and 50-75% basal cover with moderate gaps between plants, intensifies raindrop impact and increases overland flow. The site tends to be more xeric as runoff increases.**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** **No compaction layer or soil surface crusting should be evident in any of the State 1 plant communities.**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: HCPC: Tall stature, warm season rhizomatous grasses > mid-stature, warm season bunchgrasses grasses> mid stature, warm season bunch grasses > forbs >shrubs. Plant community A: Mid-stature, cool season bunch grasses > mid-stature, cool season rhizomatous grasses> short stature, warm season rhizomatous > forbs > shrubs.

Sub-dominant: Plant community B: Mid-stature cool season bunch grasses > mid-stature, cool season rhizomatous grasses > short stature, warm season rhizomatous grasses > forbs > shrubs.

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Plant mortality and decadence very low in HCPC and Plant community A. In periods of drought, shrubs would exhibit decadence in the state 1 reference communities.**

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14. **Average percent litter cover (%) and depth (in): Litter cover is in contact with soil surface. Litter decreases in Plant community A to 40-50% and depth is reduced to 0.5 inch. Litter decreases to about 15% in Plant community B and is less than ½ inch deep.**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 1000 - 2000 #/acre from Plant community B to HCPC in the State 1 reference community.**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Needle and thread, blue grama, threadleaf sedge, fringed sagewort, green sagewort, plains prickly pear, broom snakeweed, yucca, leafy spurge, dense clubmoss.**

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17. **Perennial plant reproductive capability: All species are capable of reproducing in HCPC and Plant community A. In Plant community B, plant seedlings will be weighed in favor of marginal and undesirable species. Replacement of desirable species will be very few.**
